COMMODORE Disk User

JULY/AUGUST 1988
£2.50

FOR C64 AND C128 USERS

IN THE MAGAZINE ▶▶

INSIDE TRILOGIC
ACCOLADE ACTION
HIDDEN SECRETS OF THE 6510
ADVENTURING:
MULTIUSER MUD MEETS THE MICRO
DUNGEONS & DRAGONS PREVIEWED

AT LAST! A VERSION OF MUD FOR HOME COMPUTERS.

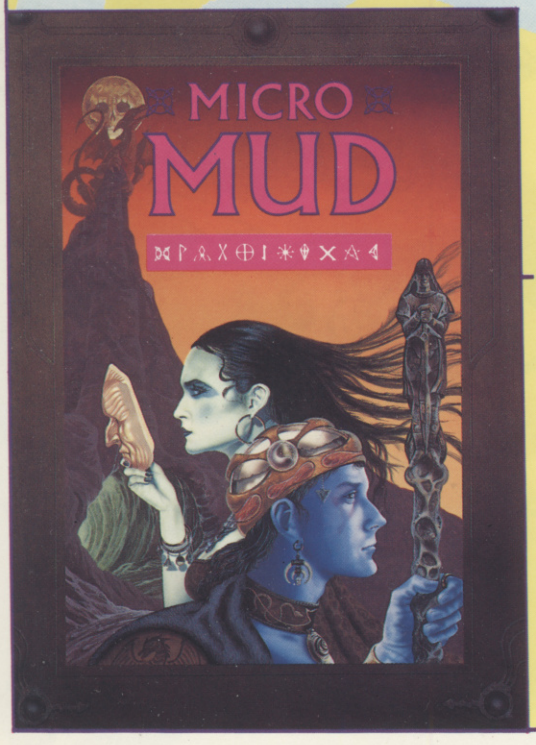
MICRO MUD

MAINFRAME MUD-MULTI USER DUNGEON is an extremely popular multi-user game. You can *'log-on'* with a modem and become part of an imaginative computer-generated adventure. You interact with other players logged on the system at the same time.

Now you have the opportunity to play MUD without a modem – and without any phone bills! MICRO MUD simulates the other players, you will be interacting with up to 10 at once (*from a choice of 100*) and *'mobiles'*, computer generated monsters.

You will map and explore 400 atmospheric locations. Your aim is to score as many points as possible, thereby raising your status through 10 levels, the ultimate is *witch* or *wizard*. You will use commands and spells, the higher your level the more effective these will be.

The MICRO MUD package contains two 5.25" discs, comprehensive instructions and Century Communication's excellent paperback, *'An Introduction to* MUD', by *Duncan Howard*.



Available from all good software stockists or directly from VIRGIN GAMES.

Please send me MICRO MUD!

COMMODORE 64/128 – Disc only – £14.95

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Please make crossed cheques or postal orders payable to Virgin Games Ltd and send to Virgin Games Ltd, 2/4 Vernon Yard, Portobello Road, London W11 2DX.

Please do NOT Post Coins or Money!

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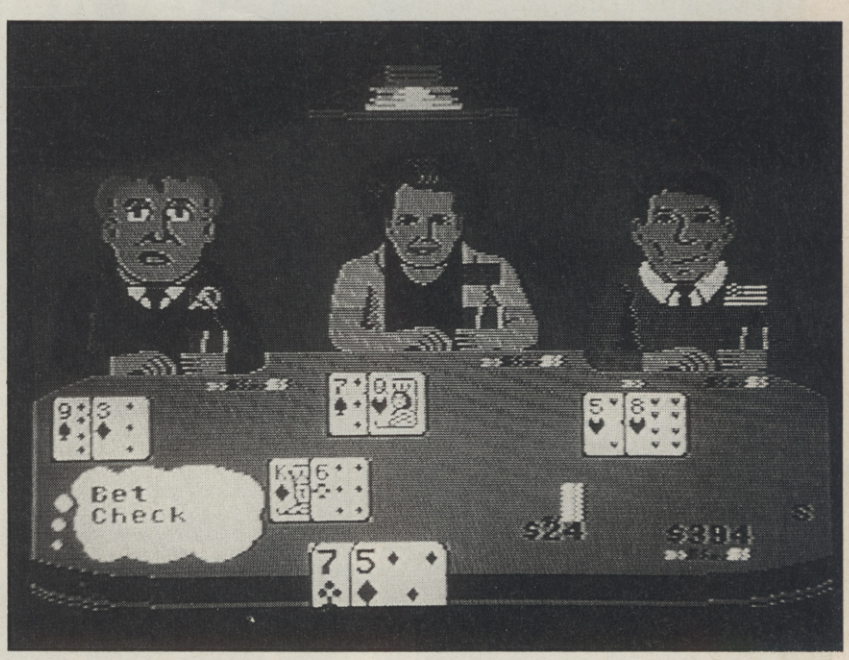

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Update

What's going on, who's doing it and where it's happening

Codemasters get fresh!

LWT's Get Fresh program (Gilbert rules O.K.) play host to Codemasters' launch of The Race Against Time, the first game written specially for charity. The game features famous locations from around the globe and music by Peter Gabriel. All proceeds are to go to Sport Aid '88, the beneficiaries being children worldwide. So dig deep!

Codemasters also announced a free prize draw last month, entry forms are available from W H Smith, John Menzies and other software outlets, no purchase is necessary, and the prize is an Amiga computer. The draw will take place on 18th August this year.

Microprose signs Cosmi.

Birmingham-based US Gold lost out to Microprose when top US publisher Cosmi decided a change of scenery was needed. Microprose will be responsible for marketing Cosmi's latest projects, Defcon 5, The President is Missing and in the future Super Huey III, in Europe and Australia.

YER RS232

York Electronic Research could be the answer to many of our prayers. This two-man team specializing in communications and utility products for Commodore computers are said to be providing a level of customer support unthinkable from any high street shop.

YER is offering its RS232 interface manual as a separate item. RS232 became interpreted differently by different manufacturers. The end result being confusion, the term 'standard' losing a lot of its meaning. This manual helps explain the complexities of RS232, and will be of use to anyone with a MODEM or a serial printer. Included in the manual are hints and tips for programmers, telephone numbers for bulletin boards as well as information on hardware connections. A telephone call to YER is all that is necessary to alleviate any persistent problems, apparently they seem to welcome problem printers. Good luck to YER! For more information contact York Electronic Research, The Fishergate Center, 4 Fishergate, York YO1 4AB Phone: (0904) 610722
The manual is available free with a cost of £1 for p&p.

Elite goes Beyond the Ice Palace.

May 23rd is the projected release date for Elite's latest game, Beyond The Ice Palace.

Beyond The Ice Palace is a game of magical fantasy and your quest is to rid the forest of evil spirits and return the land to peace and normality. Only time will tell whether this will notch up another hit for Elite. Ice Palace will cost £14.99. Contact Elite on (0922) 55852 for more details.

Star Fleet 1 – The war begins.

Interstel, distributed by Electronic Arts, has announced the release of Star Fleet 1, the first in the Fleet series. Star Fleet 1 is described as a space battle simulation featuring intensive strategy and role-playing.
Players command a galactic heavy cruiser in an effort to protect the outer regions of the Alliance from invading warships. Beat me up Scotty! Star Fleet 1 costs £14.95. For more details contact Electronic Arts on (0753) 49442

Gremlin gets its skates on!

Tired of racing and flying simulators? Try Gremlin's roller skate simulation Skate Crazy. The game features skating poseur Freddy in an attempt to gain all important 'Street Cred' by attempting posy feats. Points gained on the 'Cred-o-meter' are offset by the 'Ouch-o-meter', measuring bumps and grazes..... Let's hope the game has more to it than this!

Also due for release is Blood Brothers. The brothers, Hark and Kren come from a distant planet, plundered by other aliens. Their task is to recover the gems..... Street Crazy and Blood Brothers will each cost £14.99 For more info contact Gremlin on (0742) 753423.

Expert goes for Warp Speed

Rocket is Trilogic's latest disk turbo which loads Expert Rocket files at very high speeds. The company says that in conjunction with Trilogic's File Press super compactor, it can reach speeds undreamed of until now. Rocket reprocesses Expert files into sequential sector files which increases transfer speeds. Trilogic says that in tests the new system took just 10 seconds to load a 230 block file (over 57 kilobytes) – including the time taken to find the file, load, and decompact it.

Current owners of Expert cartridges can receive the Rocket turbo converter, improved backup system and optimum autofire facility as part of the latest Trilogic V3.2R UPDATE DISK for just £3.50 but the disk is also included with The Expert cartridge for a total price of £29.99.

According to Trilogic, the Rocket is comparable to any system currently available – including complicated, expensive hardware systems like Dolphin DOS or Professional DOS – and offers the advantages of a high quality backup system, a sprite extractor, machine code monitor, hi-res screen dump and future expandability.

The cartridge wars continue. In the mean time, if you're interested in The Rocket, contact Trilogic on (0274) 69115.

Vixen: The foxy lady of Granath?

The launch of Martech's latest game, Vixen, caused a few hot flushes, as a leopardskin-clad temptress posed for photographers. We had thought of having a whip-round for her, but she already had one of her own.....

The game itself features our skin-clad heroine in a role not dissimilar to Martech's Tarzan epic of last year. "For millions of years dinosaurs roamed the planet's surface in search of prey, and have destroyed all but a few of the mammals, and all of the humans – or have they?"

"Our lone heroine, Vixen, was raised by foxes and has magic powers. With her ability to change into a fox and her magic whip in hand, she is fierce, brave and a match for any of her foes." reads the press-bumph. Perhaps more importantly digitised video graphics and sideways scrolling may make this worth checking out. Vixen will be available on C64 disk at £12.99. For more details contact Martech on (0895) 7262.

Thief of fate

The latest instalment in the Bard's Tale series has arrived. The third in the series of award-winning medieval fantasy role playing games will feature more spells, more monsters and more dungeons than its predecessors. In Bard's Tale III, the fabled city of Skara Brae has been left in ruins. As the townsfolk celebrated a victory over the evil Mangor (the objective of Bard's Tale II), his master, The Mad Dog Tarjan, arrives seeking revenge and reduces the town to rubble. Skara Brae is only the first in a long line of cities which Tarjan has threatened to destroy. The rest is up to you..... Bard's Tale III will cost £14.95. For more information talk to EA on (0753) 49442.

Remember Light Rifles?

If you are old enough to remember the TV ping-pong / light rifle game consoles, you would be forgiven for thinking that Liverpool based Gamesware has taken technology back a few years.

Gamma Strike comes complete with two pellet firing guns and a target. The target is designed to plug into the user port at the rear of your C64 or C128. The computer monitors exactly where pellets hit the target and computes your score.

Three games are supplied with the Gamma Strike package – Competition Shootout, Voyager 19 and The Alien Team. Each game uses the target as an input device, where you hit the target determining how well you do in the game.

I can't help feeling that the pellet guns will find other uses than just with the Gamma Strike Target.

For more information contact Gamesware, 59-61 Church Street, Liverpool L1 1DE TEL 051-708 7020.

DISK INSTRUCTIONS

Before you use your disk for the first time, read this.

We have done our best to make sure that Commodore Disk User will be compatible with all versions of the C64 and C128 computers and their associated disk drives.

Getting the programs up and running should not present you with any difficulties at all, simply put your disk in the drive and enter the following command:

LOAD "MENU",8,1

Once the disk menu has loaded you will be able to start any of the programs simply by pressing the letter that is to the left of the program that you want to use.

C128 users please note that you should be in C64 mode when using the disk. You can enter C64 mode by either:

i) Holding down the Commodore key (bottom left of the keyboard) when turning the computer on or,

ii) After turning the computer on type G064 and answer "Y" when prompted "ARE YOU SURE?".

It is possible for some programs to alter the computer's memory so that you will not be able to LOAD programs from the menu correctly until you reset the machine. We therefore suggest that you turn your computer off and then on before loading each program.

Copying the programs

The disk is not protected in any way so you can copy the programs onto your own disk should you wish. A file copier, that to our knowledge will work with all drives, is included on the disk for this purpose. All of the programs can be loaded independently of the menu by following the instructions with the relevant article.

How to copy CDU files

You are welcome to make as many of your own copies of Commodore Disk User programs as you want, as long as you do not pass them on to other people, or worse, even sell them for a profit.

For people who want to make legitimate copies, we have provided a simple machine-code file copier. To use it, simply select the item FILE COPIER from the main menu. The copier works with a single drive, is controlled by means of the function keys as follows:

F1: Copy file - the program will prompt you for a filename

F3: Resave the memory buffer - you may get an error on a save (perhaps you left the drive door open). Use this to try again.

F5: Disk commands - allows you to enter any regular C64 disk command

F7: Displays the directory

F2: Exits the program and returns you to Basic.

Disk Problems

Should you have problems loading any of the programs on the disk DO NOT return them to the editorial office. All faulty disks should be returned to:

Commodore Disk User Vol 1 No 5
Returns
Disk Copy Labs
20 Osyth Close
Brackmills Industrial Estate
Northampton
NN4 ODY

and a replacement disk will be sent to you free of charge.

NB. Do not return the magazine.

Apologies

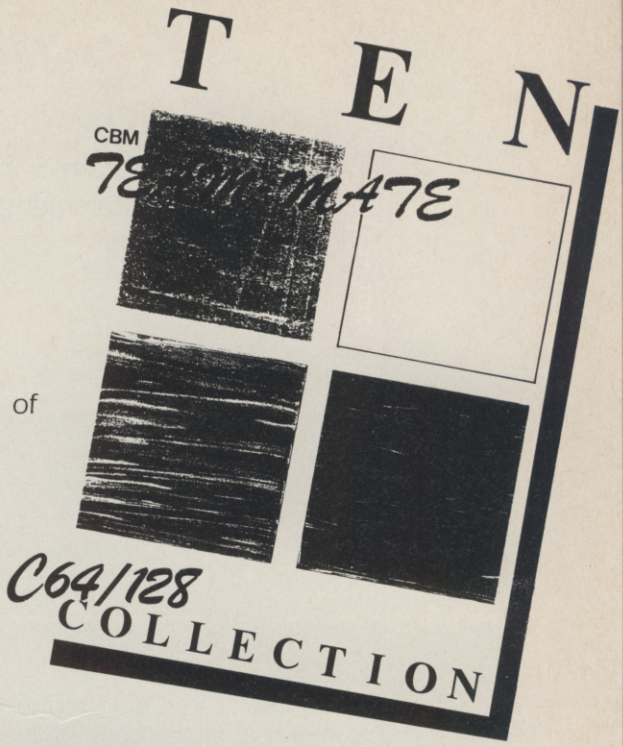
Nothing too serious this month. First off, a bit of history. Malcolm Gallon, author of Disk-Mate, the powerful little utility we ran in our second issue, has asked us to point out that the program needed a Basic loader to run properly from our disk. He adds that any intelligent reader will have figured that out, and in fact we have had no complaints whatsoever about Disk-Mate. So you can all pat yourselves on the back. We of course lose another brownie point.

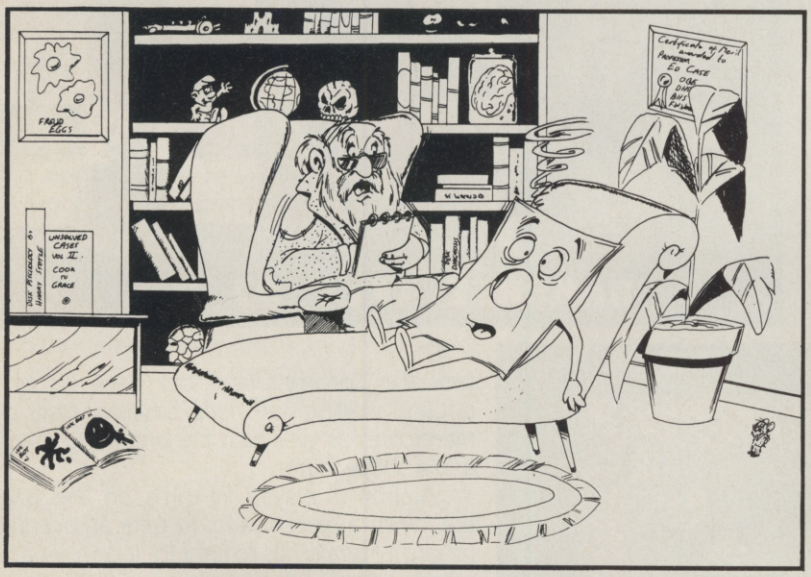
Plus one more for DrumSynth in the last issue. The program works fine, but we made a last minute change to the demo pattern provided, leaving out the PAT. suffix which DrumSynth expects. So if you want to load this, change the name of the file to PAT.DRUMDEMO and load DRUMDEMO as usual from DrumSynth's disk menu. No serious bugs this time, though, I'm sure you'll agree.

COMPETITION

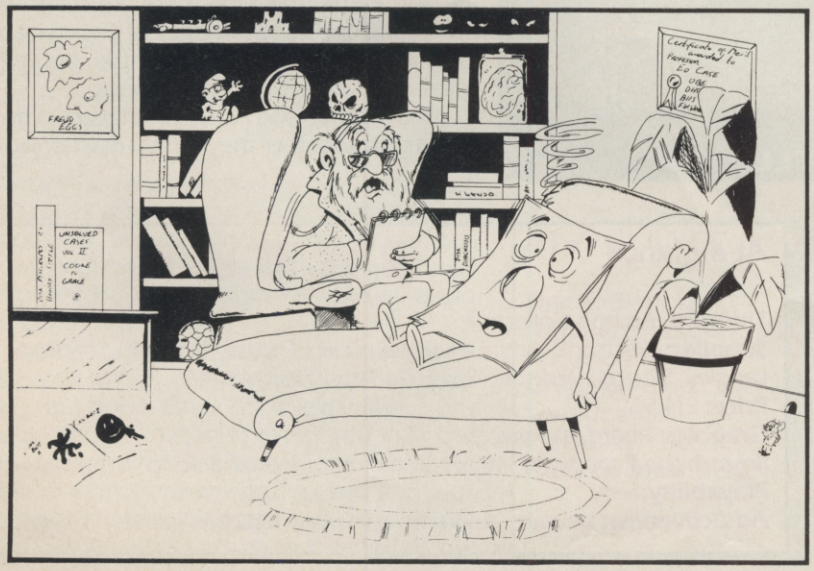
Get yourself realigned - on us!

Get this competition right, and you may win a bunch of indispensably useful goodies from Robtek





SPOT THE DIFFERENCE COMPETITION



This issue's thirty lucky winners will get a combination prize - Robtek's Disk Alignment Kit, plus Team-mate, the company's powerful productivity package. Team-mate comprises wordprocessor, database, spreadsheet, plus a high-resolution graphics package capable of producing pie charts, bar and line graphs from the data produced using the other three programs.

How to Enter

Study the two cartoons. Once you have decided how many differences there are between the two, complete the entry coupon and send it to the editorial address (see below). Please write the number of differences that you have found on the back of the envelope. If you don't, then your entry will not be accepted.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications. This restriction also applies to employees' families and agents of the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.

Disk Alignment competition Entry Coupon

Name .....
Address .....
.....
.....
Postcode .....
Number of differences found .....

Post to: Commodore Disk User, Disk Alignment Competition, 1 Golden Square, London W1R 3AB. Closing Date: 31st August 1988.

Reviews

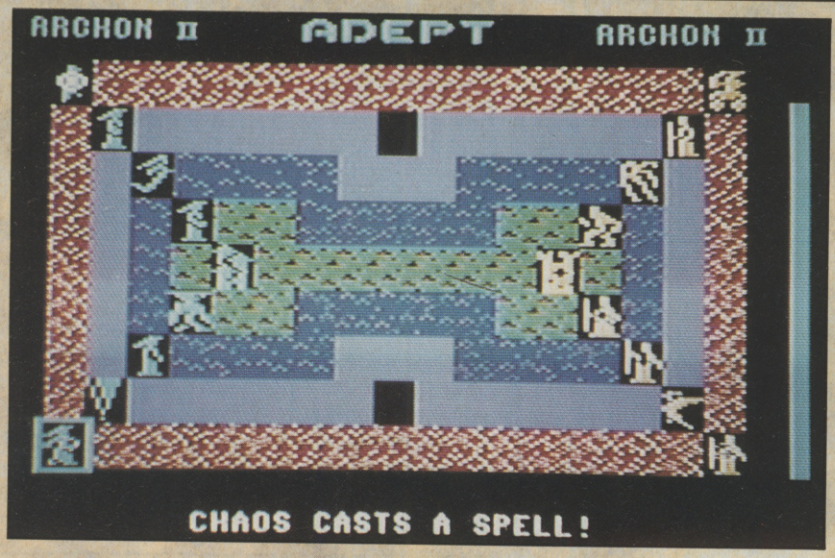
Our team of intrepid reviewers analyzes the latest batch of computer entertainments

The Archon Collection

Archon was one of the first Electronic Arts games that were imported into the UK through Ariolasoft. Now EA have rereleased this classic game, together with its sequel, Adept, to form the Archon Collection.

Anybody looking at a screenshot of Archon may be mistaken and think that it's simply a chess variant. That's a mistake that would cost them the game. Although the board has the familiar chequered display, it changes colour as it shifts through a cycle from light to dark and then back to light. Five power points glisten and are the object of the game. If you occupy all five you've won but it will take a hard fight to get that far.

The key to Archon is its pieces, as each represents a magical creature with their own strengths and abilities. On the side of light there is a line of soldiers supported by unicorns, archers, golems, valkyries, djinni and a phoenix that can explode into a ball of fire. These are all controlled by a spell-casting wizard. They face the Sorceress and her dark forces of goblins, wailing banshees, basilisks, trolls and manticores as well as a fire breathing dragon and a shapeshifter.



Archon is played in turns on the board but when a piece wants to take an occupied square it literally has to fight for it on a separate arcade screen where the piece's strength and speed and the player's skill decides the battle.

Archon II, subtitled Adept, is set on a board representing the four elements of air, water, fire and earth. This time there are six power points and good and evil citadels. Four wizards face four sorceresses in a battle between summoned elementals and demons.

Both Archon and Adept are classics in their own right, together they form a masterpiece.

TH

At a glance

Title: The Archon Collection.
Supplier: Electronic Arts, Langley Business Centre, 11/49 Station Road, Langley, Slough, Berkshire SL3 8YN **Tel:** (0753) 49442
Price: £14.95
Graphics: board and pieces
Sound: the flapping of wings, stamping of feet and firing of missiles
Playability: very
Addictiveness: beware, these are two very addictive games

Black Lamp

Black Lamp is the name of the game,
The hand of the Princess is your aim,
But you're not a prince but a jester named Jack, To please the King you must get the Black lamp back, the lamp was stolen by evil dragons, no jest, so swap your jokes for magic bolts and begin your quest, The fate of the land rests with you, So enough of this poem and on with the review.

Armed only with your wits, a few guaranteed break-the-ice-at-parties one-liners, and a belt that fires magic bolts you leave your beloved Princess and into the evil infested land. Your courageous quest will lead you through rustic landscapes and into gothic buildings but this is no sight-seeing trip as the evil minions immediately attack you.

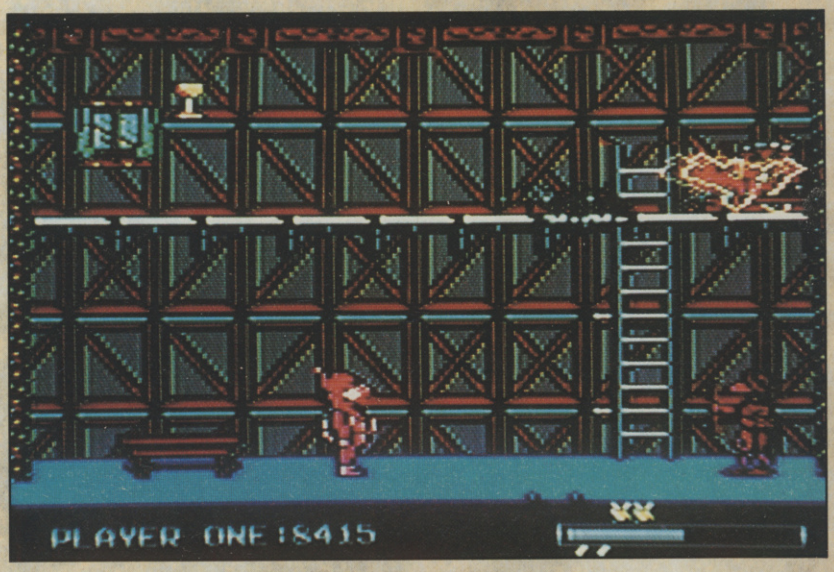
Before you've even worked out which joystick move allows you to climb stairs you're under attack. Werewolves hurl themselves on you, buzzards bomb you with exploding skulls. Goblin warriors, slime witches, trolls and imps bombard you with a barrage of swords, arrows, spears, fire and even globs of gooey, green slime.

Your quest is not only to recover the black lamp but also the red, purple, blue, cyan, yellow or white lamps necessary to fill up the chest on the first screen. As you increase through the game's levels the action speeds up and the number of black lamps required increases.

Although the other lamps are necessary to complete a game level they are easy to collect as they're scattered throughout the game levels. The black lamps are always guarded by a dragon. While the game's other critters vary in strength and the number of hits needed to kill them, the Dragons are always tough. They must be hit several times in weak parts of their scaled bodies, to eventually kill them while they attempt to fry you with jester-smashing fire bolts.

The game is a curious medieval mix of platform game screens and sideways-scrolling arcade adventure action. The platform screens represent the insides of buildings that actually contain the lamps and other useful objects as well as tables and barrels to jump from to get to the higher platforms. Unfortunately, to get to these you have to run the gauntlet of the sideways scrolling landscapes. You are subject to such a battering that it's almost impossible to go from one building to another without losing enough energy to cost you one of your lives. Which probably explains why you begin the game with seven.

Inside the rooms you may also find food and drink to top up your energy and objects to help your quest. Finding a shield will give you magic armour that will protect you from the next twenty direct hits (lasts a few seconds), a musical instrument will protect you and your energy if you fall too far and weapons will give you 15 super shots which will wipe out the more powerful critters such as trolls and witches with a single shot but won't help you against the dragon.



The graphics add a lot to the games atmosphere, particularly the appearance and animation of the critters you'll face, but I doubt you'll have time to look at them. Your efforts are accompanied by a boppy, computer soundtrack that contains a few well known tunes hidden in a annoying background beat. If it was released as a record it would probably go to number one but I turn it down so I can concentrate on the considerable quest in hand.

A good mixing of two tried and tested game techniques that results in a game that's remarkably addictive. **TH**

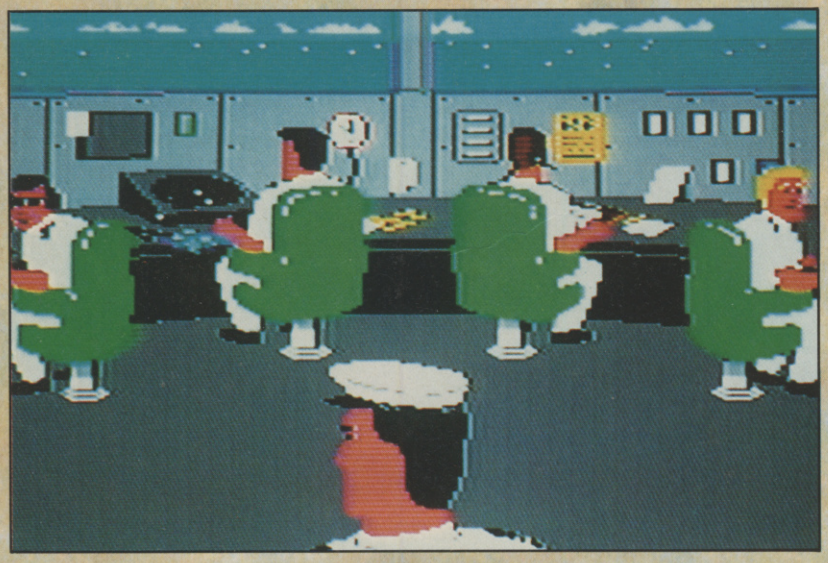
AT A GLANCE

Name: Black Lamp
Supplier: Firebird, 64-74 New Oxford Street, London. **Tel:** 01-379 6755
Price: £14.95.
Graphics: Good animation.
Sound: bobby
Playability: good
Addictiveness: very.

Power at Sea

Have you got what it takes to Captain a task force sent to take the Leyte Gulf, Japan's last line of defence? Within 96 hours and with only three ships you must take four heavily defended Japanese bases.

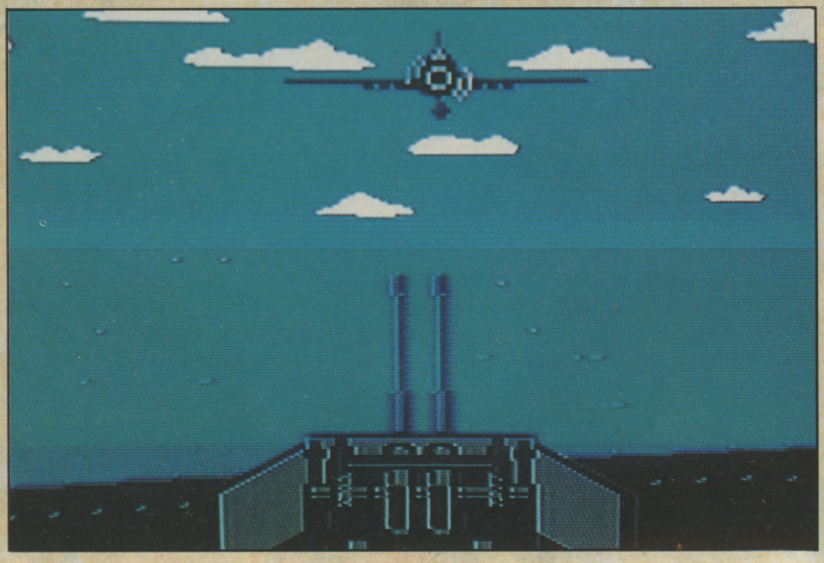
The game begins with you deciding on the resources you'll need to do the job. By moving your joystick you must decide how many fighters and bombers to cram onto the flight deck of your aircraft carrier, troops and supplies to fill your troop carrier which effects the amount of room left for fuel for the whole fleet. As captain of the fleet you control operations from the bridge of the flagship the Iowa class battleship. Your job is not only to complete your mission but also protect the two other ships in your fleet.



From the bridge you can call to your four officers that are sat in front of you and through them you receive radio signals from HQ, check for damage to the fleet, plot your course, set your speed or man one of the ships weapon systems.

If an enemy approaches, your radio operator will warn you so you have time to man the appropriate response. This can happen at any time, usually when you're calculating your course, so you have to keep alert.

Your first contact with the enemy will probably be enemy fighters which can be shot down by manning the anti-aircraft guns. You have to be particularly careful that no kamikaze pilots get to the rest of your fleet as one can take out your entire carrier flight deck and all your planes with it. Although destroyers attack singularly they pose an even bigger threat and so you launch two attacks against it. First you scramble your planes, fighters first to take out its anti-aircraft guns and then bombers to take it out and if that fails slug it out with the main guns when it comes into range.



When you reach a base you begin your assault by bombarding the shore gun emplacements with the battleship's guns before landing your marines on the beach.

Power at Sea puts you in the hot seat throughout the action. During an attack by enemy aircraft you control the elevation and direction of the guns so you can't blame a "bug in the program" if things go wrong. Attacking the destroyers is probably the hardest as you have only a few moments to steer on target, take out the guns and get out before you're shot down. The bombing runs are even harder and impossible if the destroyer has any deck guns in fact as the bomber is an easy target then, if you've survived this far you must time the bomb release to hit the target.

As with the other Accolade games Power at Sea is fully joystick controlled through screens representing the parts of your task force with the bridge and the officers your control screen. The gameplay is similar to games such as Beach Head (Access) and Destroyer (Epyx) but with more atmosphere and action supported by impressive graphics and sound effects. I particularly like the mini graphic screens that show your men rushing to battle stations, your planes taking to the skies or your marines storming the beach. **TH**

AT A GLANCE

Name: Power at Sea
Supplier: Electronic Arts, 11/49 Station Road, Langley, Berks, SL3 8YN.
Tel: (0753) 49442
Price: £14.95
Graphics: good.
Sound: bang, bang, splash!
Playability: great
Addictiveness: I'll get them next time..

Impossible Mission II

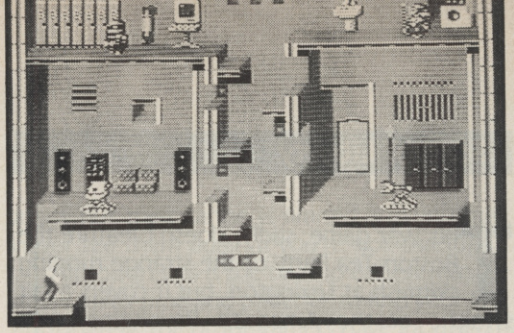
Elvin Atombender is back to his old tricks. In just eight hours he plans to launch enough missiles to destroy the world. You, our special field agent, are our only hope.

Fans of the original Impossible Mission will recognise Elvin's evil works and realise that the task ahead will demand a combination of skill and strategy, as he is holed up in a tower complex guarded by laser firing droids and security passwords.

To get from one tower to the next you must crack the three digit codes by searching everything you can find for coloured numbers. These you can then manipulate with your pocket computer until you have them all in the right order when the completed message will appear to lead you to the next tower.

Searching a room can be a dangerous job, as the objects you need are scattered around platforms connected by moving ramps and guarded by security droids. The standard droid will be familiar to all IM fans but in this sequel it is joined by the minebot that covers the floor with explosive charges, pestbots that aren't dangerous but can leave you stranded as they ride up and down on the lift ramps, bashbots that shove you off platforms and suicidebots that leap to their death taking you with them.

Being fried by a sentrybot or plummeting off a platform after a mistimed leap doesn't cost you a life but instead produces a



bloodcurdling scream from your monitor and loses you a few vital seconds.

A skilful player can login to the security terminals and start programs (that have been found by searching object) that reset lift platforms, drop mines of your own, deactivates the robots for a few seconds or a time bomb that can be set to blow open safes that contain the pieces of a musical code that will eventually lead to Atombender's inner sanctum.

More robots and improved graphics add to a new mission that is a must for new or old IM fans. **TH**

At a glance

Title: Impossible Mission II.
Supplier: US Gold/Epyx, units 2/3 Holford Way, Holford, Birmingham B6 7AX **Tel:** 021-356 3388
Price: £14.99
Graphics: Better than the original
Sound: screams and speech including the classic "Another visitor, stay awhile..."
Playability: Easy to play but difficult to win
Addictiveness: Don't load it in if you plan on doing anything else

Pandora

The generation ship Pandora was sent out 200 years ago crewed by a combination of men and androids with a mission to contact intelligent life. Now the giant ship has been detected again and it's heading straight for Earth. Your mission, as a galactic salvage engineer, is to board her and collect as many alien artifacts as you can before Earth's defences destroy her.

As you board the Pandora one of its remaining crew rushes up to you and gives you her ID card which is just as well, as the slightest move attracts the deadly attention of the roof lasers that destroy anything that's "unauthorised".

The ship is divided into section such as the living area or garden sector and you must have the right ID otherwise you'll be attacked by the security droids that patrol the ships corridors. The rooms and corridors appear on the smooth scrolling screen above a display that shows your health status, the distance to Earth (time left in the game) and any objects that you are carrying in your hand, pocket or backpack.

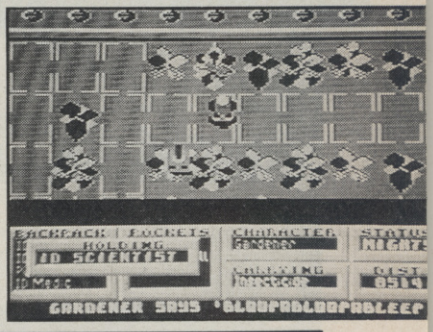
These objects are the key to the game as by collecting weapons you can survive, ID cards will allow you access to more of the ship and others ranging from squash balls to hypodermics can be traded with the game's human characters for more useful objects.

Computer terminals are scattered around the ship that can be logged into it you have the right ID card and these will give you clues such as what will kill some of the powerful mutants that populate the ship and coincidently guard important areas of the ship.

Combat is all about timing. To hit someone or something you have to press the fire button as a bar moves across a gauge and if you mistime it the blow is drastically weakened. Weapons you pick up not only effect the ammount of damage a blow will do but also how often you can strike.

Pandora is a clever mixture of adventure, puzzle solving, exploration and combat that's well worth exploring. One final tip, stay away from the thief, as this character whizzes around at high speed and will steal all your ID's with the slightest touch leaving you to be fired at by the roof lasers.

TH



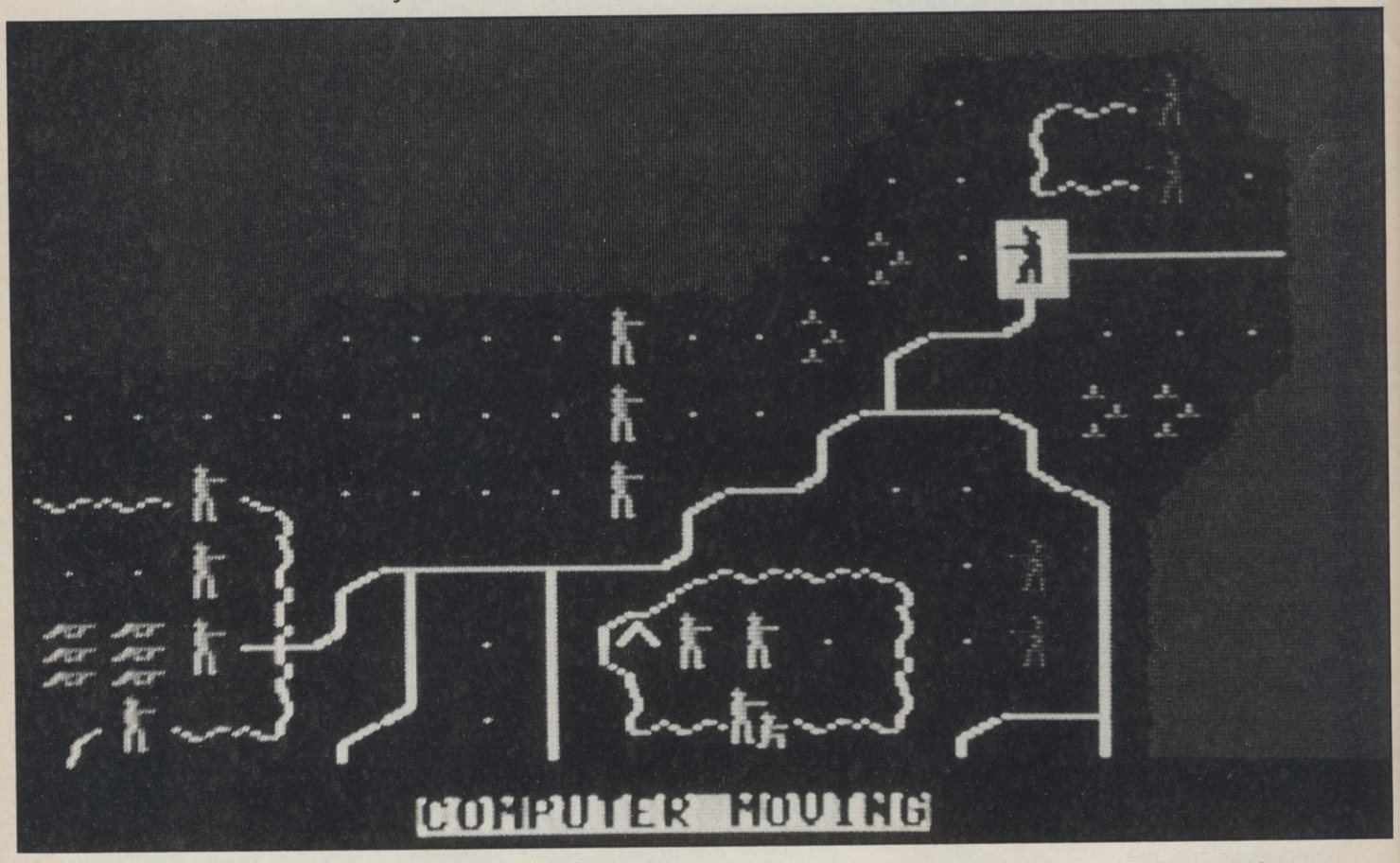
At a glance

Title: Pandora
Supplier: Firebird, 64-74 New Oxford Street, London WC1A 1PS **Tel:** 01-379 6755
Price: £12.95
Graphics: The spaceship, the droids and everything
Sound: nothing memorable (I turned the sound off)
Playability: Not for the weak willed or squeamish.
Addictiveness: One for the collection.

Sons of Liberty

This war game, sadly, doesn't feature the Boston Tea Party or the strange running skirmish at Lexington, but it covers a fair swaithe of the American Revolution with recreations of the classic battles of Bunker Hill, Saratoga and Monmouth.

This is a pleasant little stroll through history compared with SSI's other hefty offering this month. There's definitely something almost frisky about Sons of Liberty.



The game is designed by Kucera, Landry and Kroegel, previously known for their versions of Gettysburg and Shiloh. Unlike the Civil War, however, the War of Independence did not really turn out many easily simulated setpiece battles.

The impression one always gets is of an epic muddle on both sides. As the documentation says of the first battle in the package: "Bunker Hill was more notable for the failure of both sides to observe the principles of war than for intelligent military leadership..."

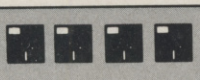
The designers have made the best of it though. Bunker Hill is very playable, even if it wasn't militarily sound. It isn't an easy win by any means for the British, even if they are facing half-trained irregulars.

It's nice to see joystick control on an SSI game, which gives you the chance to browse over the map at leisure, and the choice of map scales makes it rather more attractive than some of the company's classics. The documentation is considerable, as usual, right down to little historical vignettes explaining the significance of each battle. You get the manual, a historical reference guide, and three glossy maps to clarify what's on the screen.

Play is along the usual 'phased' lines, with turns for movement and various sorts of combat, such as firing from a distance and melee. The movement phase is very user-friendly. You simply move the unit around the map until you've used up its allotment of movement points.

Sons of Liberty should not be a hard game to learn, even for a beginner to computer wargaming, but it does allow lots of scope for expansion, with basic, intermediate and advanced rules available. Easy to play, hard to win. **FF**

At a glance



Title: Sons of Liberty
Supplier: Strategic Simulations Inc/US Gold, Units 2/3 Holford Way, Holford, Birmingham B6 7AX **Tel:** 021-356 3388
Price: £24.99
Graphics: Much-Revered SSI formula
Sound: To be quite Franklin, nothing much
Playability: Causes no Paine
Addictiveness: I hold this to be self-evident

Strike Fleet

This must be PHM Pegasus' big brother. You can indulge in fictitious Falklands sea battles, take on the mighty Russian fleet or escort tankers up and down the Gulf. Well, at least one's fairly topical!

Actually this is probably the best strategy game I've seen. Controlling one ship is difficult but when you have a fleet which can be split up into smaller units, the game enters a very realistic dimension. All of the battles are shown in 3D and you can send out helicopters as surveillance craft or airborne torpedo launchers to get a real close up view of the enemy.

The missions are graded in ascending order of difficulty, starting with a lone pacifist escort mission in the Gulf and rising to full blown fleet wars in the frozen Icelandic seas. If you take my advice don't get too ambitious too soon or you'll soon experience life under the ocean waves.

Each ship carries armament according to its class and after a little bit of preliminary searching and commanding of the fleet you're soon locked in mortal combat with a foxy fleet of Ruskies or Argies though you may find yourself ducking the Silkworms off Iran.

This is about as realistic as I'd want a war to be. Exocets, jet bombers, warships close in from every side cutting the fleet down one by one.

I particularly enjoyed the submarine mission off the Falkland Islands where two Argentinian subs are making for the Task Force and must be stopped at all costs. Armed with a limited arsenal of torpedos and just two ships, the hunt and stalk methods which you need to employ are really gripping.

In this mission you first have to find your prey, assisted by sonar. This means sweeping back an forth until the tell-tale blip appears on the screen. Four helicopters can be sent out to assist but their range is limited and you may never see them again if you're not careful.

Although this is the second easiest mission it still takes time and patience to find your foe. Fortunately, the programmers have included a way to speed up to as much as 128 times real time to help you over any really dull patches. If you play the game properly, it should be rare that you need this facility. I found the odd few dull periods a good chance to relax and calm down after frantically dodging Exocets.

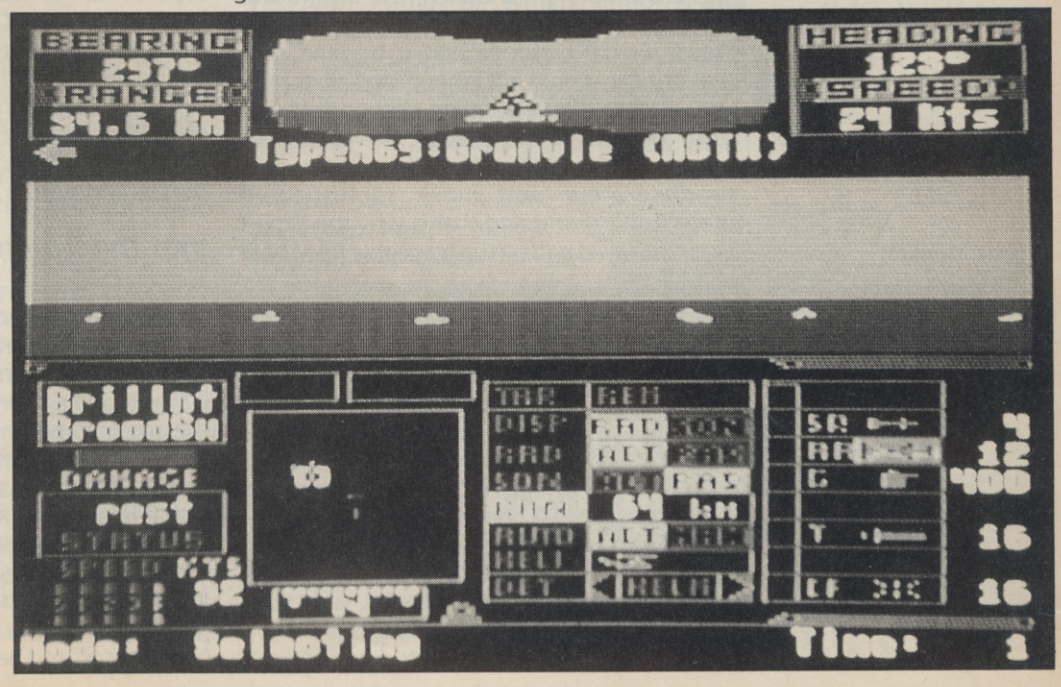
The graphics are superb. When a missile or a helicopter is launched it can be seen ripping away through the air and, if the enemy is close enough, you can see the plume of smoke as explosives bite through metal.

At a glance

Name: Strike Fleet
Supplier: Electronic Arts, Langley Business Centre, 11/49 Station Road, Langley, Slough, Berkshire SL3 8YN.
Tel: (0753) 49442
Price: £14.95
Graphics: Tremendous variety of viewpoints
Sound: Flashes, bangs and helicopter whirrings
Playability: Immensely enjoyable form of strategy game
Addictiveness: With so many missions how could anyone get bored?

Targets are selected through the binocular section at the top of the screen and just as in real battles a panic can result in the launch of a missile into one of your own ships' side. You can even view the world from the bridge of a stricken ship, watching as the blue sea closes over your head. I'm not a fanatical strategist and so I would heartily recommend this game to anyone who wants that little bit of extra challenge and class from the usual arcade game.

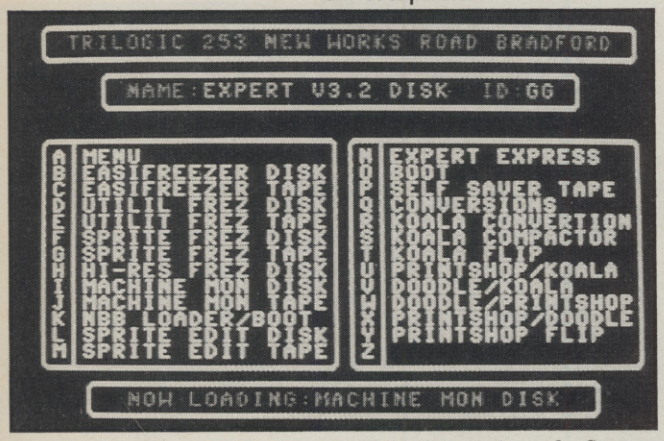
NJD



PROFILE

Trilogic: The Experts

Sometimes a product can be so successful that a company seems to be a one-line firm. Like Hoover and vacuum cleaners, Trilogic are inseparably linked to their Expert cartridges but there's much more to this Bradford company as we shall see. Before looking at the range of Trilogic's catalogue a look at the Expert's place in the marketplace is inescapable.



The Expert Menu

Trilogic consists of a five man team headed by Graham Kelly and Ian Jones. Back in the days when the Pet was everyone's idea of the perfect small business computer, Kelly got involved with programming and the need for backup tapes led to the development of the highly successful DCL1 tape to tape direct backup system which is still in use today for Datasette backups. The advent of the Commodore 64 gave rise to the idea of a cartridge-based, external RAM backup system which would be invisible to software but could be switched in without disturbing the contents of normal RAM memory.

At the time of its launch, the Expert was partially eclipsed by the appearance of the first Freeze Frame cartridge and it became clear that Trilogic would not have things all its own way. Rather than becoming despondent, the team saw this as a challenge. It was obvious from the start that software houses would produce new and more sophisticated protection systems and that is why the Expert was conceived with an upgradeable RAM base which made it simple to combat and compete with all of the ROM based cartridges which soon followed in Freeze Frame's wake.

Two more unforeseen problems assailed the fledgling Expert when companies started using the non-maskable interrupts which were at the heart of the cartridge's operating system and with the appearance of the C128. The C128 in C64 mode was relatively easy to cater for but the NMI problem was much more difficult to overcome.

Eventually, a module was produced which could be fitted between the cartridge and the computer. All later versions of Expert incorporated this ESM module but compatibility with the original cartridge was affected so an upgrade offer was made to all owners of the Mark 1 cartridge (an offer which still stands today).

Several operating systems have appeared for the Expert and there are few facilities which the cartridge cannot replicate. All but one of these is of no interest to Trilogic but I know that they are envious of the incredibly fast turbo loading system which the latest Action Replay cartridge possesses. At the moment the team are hard at work producing a comparable system which will really prove the value of using RAM chips (check the news).

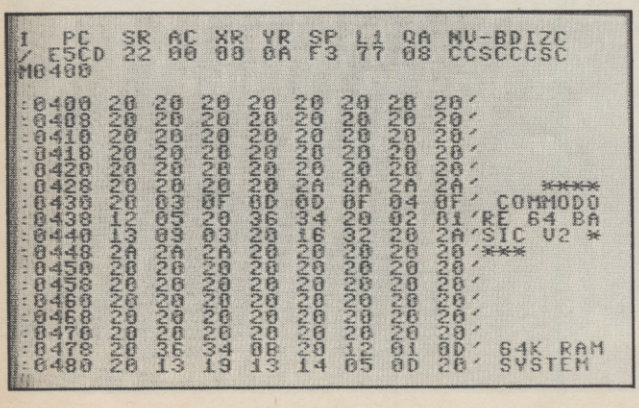
Trilogic say that owning an Expert is like possessing a range of cartridges because their disks and cassettes contain several separate operating systems which can be individually loaded into the cartridge. This not only means that a wider range can be supplied but also allows each facility to be more comprehensive than those crammed into the limited space of a ROM chip. The current version of the Expert disk is V3.2 which contains such facilities as a 64K monitor with assembler, sprite finder and saver, hi-res screen saver and printer dump, disk turbo and compactor, sprite editor, joystick port swap, autofire command and infinite lives command in addition to the full backup system and a simplified version of the backup system called Easifreeze.

Into The System

The main system within the Expert library is the monitor/assembler which acts on all 64K of the computer memory without changing it significantly. The Expert monitor is probably the most comprehensive one available with no less than 31 commands.

The only disadvantage with a RAM system is that it is volatile memory or, in other words, when the computer is turned off the cartridge contents disappear and need to be reloaded. In tests I've found that the RAM chip is of good quality and it is possible to flick the computer off and back on again without losing

Experts Monitor



the memory contents. This is not a recommended practice but can be very useful in cases of dire, do-or-die emergencies.

The menu makes loading easy and guidance screens help to make loading possible without reference to the manual. The process is to load and run the menu like a normal Basic program. All of the files are displayed and selection is made by pressing the relevant letter key. From this point the operation is automatic. Firstly, a Trilogic symbol appears with a snappy piece of music and the company name snakes around the screen while an invite to 'press space' flashes on and off. When this is done a new screen appears whichh similarly implores you to switch the cartridge from PRG to ON and press the reset button.

The cartridge has now been loaded and a welcome screen appears which outlines all of the commands available to the user for the selected operating system. This is a reminder and cannot be recalled once the OS proper is entered when the space bar is pressed again.

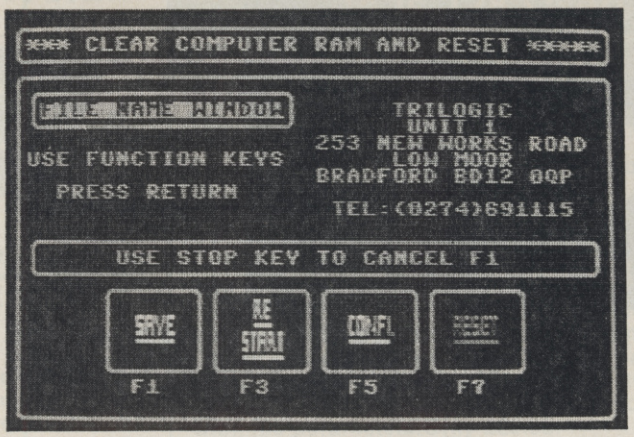
Now you find yourself in the monitor mode and to return to C64 mode the letter 'N' is entered and the computer resets to the familiar power-up screen. At any time the cartridge can be re-entered simply by pressing the RESTORE key. If this is done accidentally, 'R' followed by RETURN will return the computer back to C64 mode at the exact point at which it was left. The advantage of this is that a program can be loaded, customised through the monitor and restarted.

When writing machine code programs this function can be really useful for debugging because the program can be interrupted at will, all registered checked and altered, and then the program can be restarted. A dynamic way of debugging when normal program tracing fails to reveal the problem.

And There's More

Trilogic also produces a utility disk to accompany the latest operating system disk. Most of this disk is filled with parameters for backing up multiload programs but there are two more programs, one for moving files from one disk to another and the other for further compacting Expert files.

The Super Compactor is probably the most powerful commercially available compactor and its power is truly awesome. It may take 15 minutes to sift through a file but with an average 75% saving on disk space and, consequently, loading time this is a stunning program by anyone's standard. I tried it out on last month's disk version of Atlantis which occupied 188 blocks in normal Expert format. After compaction this was reduced to a mere 133 blocks, a saving of 55 blocks - or more than 13 kilobytes! Trilogic have on record a program of 230 blocks which was almost reduced by half to 123 blocks, which leaves me absolutely stunned.



Easy Freeze

Complaints are still received from cassette users that the turbotape function 'doesn't work'. Tests proved that this was attributable to alignment problems within the Datasette and so the idea of Datasette Doctor was born. The Doctor runs two loading tests at different baud rates and a high-baud saving test. Additionally, a head cleaner and demagnetiser is included in the pack.

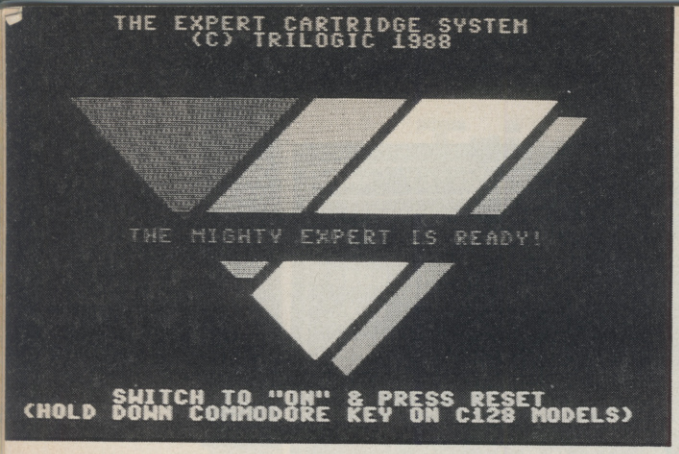
Behind The Scenes

The Trilogic workshops also provide repair facilities and their electronics expertise gives rise to various useful add-ons. No-one makes power supplies like Commodore. Apart from a tendency to fail totally, these handy little units have a facility which creates a constant irritating hum which lets you know that it's plugged in. The Titan is Trilogic's alternative power unit which, though comparitively expensive, have the advantage that they are extremely robust and can easily be repaired if they fail through ageing.

The units come in two versions - Titan 1 or Titan 2. Version 1 is a straight forward replacement for the Commodore PSU with the addition of a fused output and a larger reservoir capacitor which smooths out irregularities in the mains supply. Version 2 is the deluxe model which incorporates a mains interference filter and surge suppression circuitry which protects the computer from the more vicious power surges, or spikes, which can occur on the normal household ring main.

Spikes are often caused by refridgerators and central heating systems. I experienced the mayhem that spikes can cause when I lived in a house with an old fridge. Each time the cooling system came on it would at best cause a loud click through to the computer making a warm start, very annoying.

Another annoyance with the C64 or C128 is that software manufacturers insist on using different ports for joystick control or sometimes a two player game unnecessarily involves using a joystick in each port. Unless you're lucky enough to own two joysticks, the resultant plugging in and unplugging of the joystick is not only irritating but also causes excessive wear and tear on the plug and sockets. To combat this the Scorpion port switcher has


THE EXPERT CARTRIDGE SYSTEM
(C) TRILOGIC 1988
THE MIGHTY EXPERT IS READY!
SWITCH TO "ON" & PRESS RESET
(HOLD DOWN COMMODORE KEY ON C128 MODELS)

Ready for action

been devised. This unit plugs into both ports and the joystick can then be connected to either port at the flick of a switch.

Trilogic's DJA1 is a stand alone unit or a companion to the Scorpion which allows two devices to be connected to one port. Users with a mouse or lightpen and a joystick will appreciate the value of this unit. If you own a joystick mouse and a lightpen, two DJA1s will allow all three to be simultaneously connected to one port.

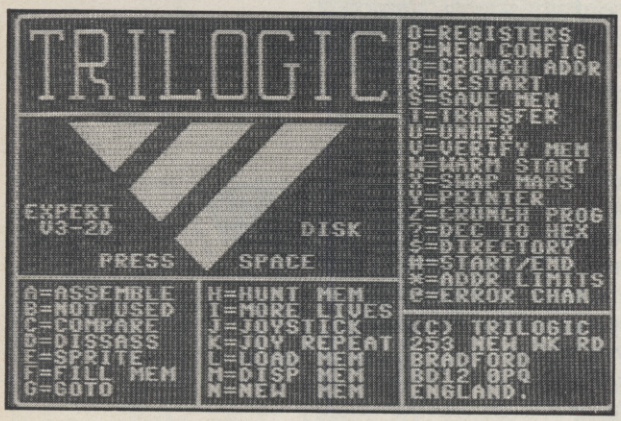
The final unit of particular interest is the Sound Digitizer (the spelling gives away its American origins) which will convert sounds from a cassette recorder, hi-fi or radio into a digital signal at least 14 seconds long. The signals can then be reproduced through the SID chip or further processed using the customiser software which is provided on a disk that comes with the digitiser.

Amiga Upgrade

Some C64 owners may be currently thinking of upgrading to the Amiga and wondering what to do with their old machine. Trilogic have the answer which is a bit of an ignominious end for the trusty C64 but one heck of an addition to any Amiga system. Instead of buying new leads for printer connection, why not use the C64 as a large printer buffer? With such a highly intelligent buffer quite a few possibilities are open.

Monitor Commands

For the moment a 4K operating system is



employed to manage memory movement but maybe in the future some of the 60K buffer space may be used for downloadable print faces which can be pushed into the printer when required under Amiga software control.

The obvious advantage of a massive buffer is that the Amiga is freed from printer output much faster than normal and the whole wordprocessing business can be speeded up immensely.

Small is beautiful and Trilogic has maintained a long history of software and hardware development through its compact family atmosphere. It has not always been plain sailing and some of their projects have hit insurmountable snags. Whatever happened to the much advertised RamboX or Phantom turbo disk systems?

RamboX has been placed on the back burner and a massive rethink is underway. The details of this rethink is something which I'm not allowed to reveal yet but the result will be stunning. Phantom has been abandoned because it is a specialised system which means that demand is relatively low but production is time consuming. A number are ready for delivery but you'll have to be quick to grab one before they all disappear.

One future development which Trilogic are considering is a battery-backed Expert which means that your favourite operating system can be loaded and stored for use, effectively simulating a reprogrammable ROM pack. If all goes well this should be available later this year but no price has yet been decided. Current owners of the Expert can quell their fears with the knowledge that the new cartridge will maintain compatibility with the current one.

The dynamic duo refuse to be drawn on how long the C64 can last but as long as there is a sizeable user base, Trilogic will be there.

At a Glance

Expert Cartridge and V3.2 OS disk	£29.99
Upgrade V3.2 disk	£3.50
Utility V3.2 disk	£5.95
Datasette Doctor	£8.99
Tape to tape backup DCL1	£8.99
Titan 1 Power Supply Unit	£31.95
Titan 2 PSU with suppression	£39.95
The Scorpion	£8.99
Dual Port Adaptor DJA1	£8.99
Sound Digitizer	£19.99
Amiga Print Link	£29.95
Computer and disk drive repairs	P.O.A.
Computer/monitor leads	P.O.A.

Supplier: Trilogic, Unit 1, 235B New Works Road, Low Moor, Bradford BD12 0QP. Tel: (0274) 691115.

Commodore Disk User and Trilogic would like to express their condemnation of the use of the Expert system for any other purpose than making personal backups of commercial software. Making copies of games for other people is theft, which robs the software industry of essential funding for future program development. Software theft is a criminal act and the thieves are fools who rob themselves of bigger and better games in the future.

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NEW 128 HELPER.

The 128 Helper is the first electronic reference manual for the 128. Let's say you are in the middle of writing a program in BASIC when you realize that you need more information on a specific command, just touch the help key, almost instantly a menu appears with all BASIC commands, select the command in question and a screen of detailed information appears, at the press of a key you return to your BASIC program. The most exciting feature of th 128 Helper is the program is user definable. The program will guide you to create your own custom screen files. This program will only cost you £24.95.

NEW The Big Blue Reader CP/M.

New from S.O.G.W.A.P. Software Inc., The Big Blue Reader allows you to transfer files generated on most IBM-Compatible (MS-DOS) software to all three operation modes of the Commodore 128 and vice versa. Thus, files can be trasferred to or from MS-DOS, 128 and CP/M disk formats, with optional ASCII translation. You may no longer be discouraged because your C128 is not MS-DOS disk compatible, or that your C128 CP/M disks are not industry standard. The program, which runs in C128 mode, is available for £29.95. Detailed information is available on request.

★★ New Little Blue Reader for 64 Users ★★

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The NEW Commodore 1581 Megabyte disk drive is now available. The NEW 3 1/2" disk drive is compatible with most commercial software and will operate on the Commodore 128, 64C, Plus/4, C16 and VIC-20. The 1581 offers the professional user,808k formatted disk capacity, (3160 Blocks Free), 8,000 Bytes per second transfer rate and sub-directories. Commercial software available includes HackPack, Petspeed, Oxford Pascal, GEOS 128, Fontmaster with Spellmaster, CADPAK and CHARTPAK. The disk drive is available by mail order for only £199.95.

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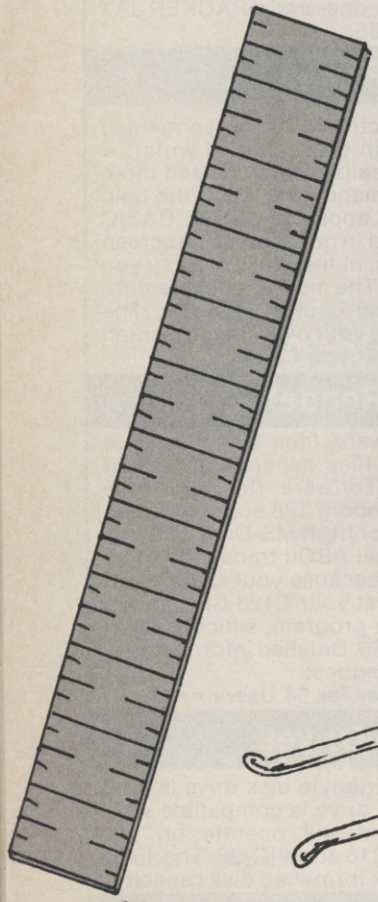
Disk Toolbox

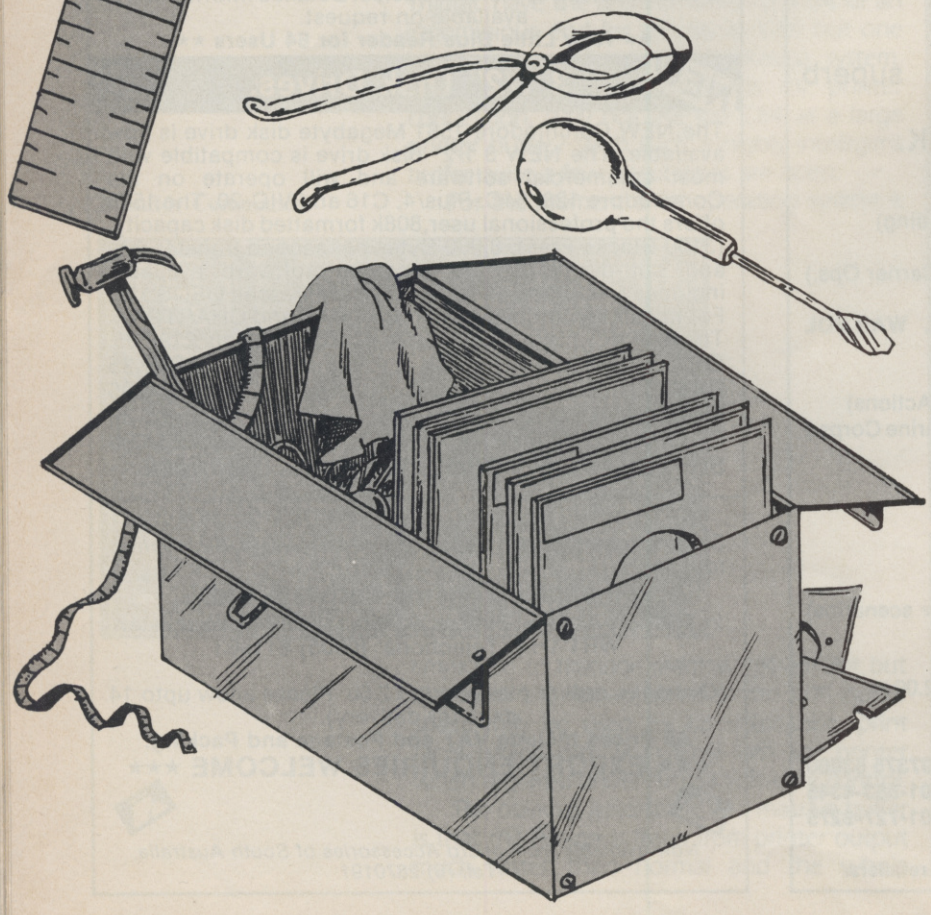
This may well be the ultimate disk utility. Toolbox gives you just about everything you'll need for disk-based happiness.

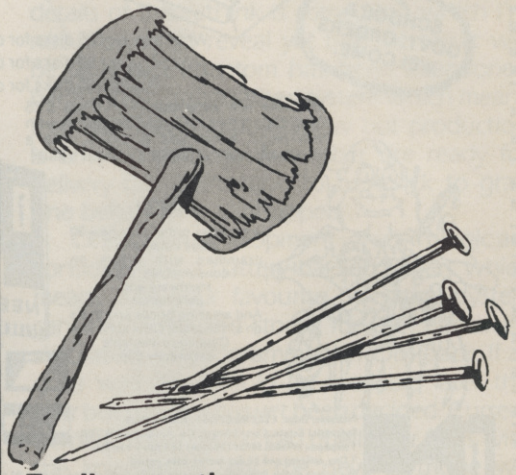
By Paul Eves



Disk Toolbox is more than just another programmers' tool-kit. It contains a full machine-code monitor, a disk editor and a lot of individual commands, including a drive speed check, that you'll be hard put to find anywhere else.

The program is largely self explanatory and is for the most part menu-driven. Just follow the on screen prompts. A few of the routines will erase the main program when selected, therefore the main utility will have to be reloaded when required. Others will erase parts of others, so once again the main programme will have to be reloaded. This should not prove too inconvenient, as the routines are designed to either run in conjunction with the main programme, or to run independently.





Toolbox routines

ALTER DRIVE NUMBER: If you have two or more drives, you can alternate between which one you are using by using this routine. When selected, you are prompted for the new drive number. Turn off all drives except the one that you will be using and follow the screen prompts.

APPEND: As the name suggests, this routine appends one program onto the end of another. It will append Basic to Basic. Basic to M/C, M/C to M/C, and M/C to Basic. I have not included a Seq file append in this routine as you can do that quite easily using the Copy command. The actual appending occurs directly on the disk, there is no loading or saving to be carried out by the user.

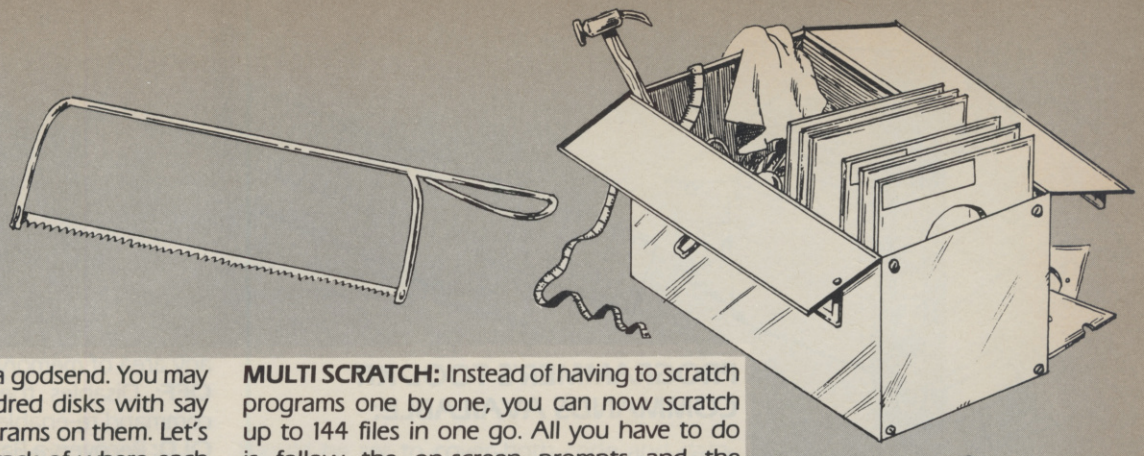
CONVERT NUMBERS: A simple number conversion routine. It will convert the following types: Hex to Dec, Dec to Hex, Dec to Bin and Bin to Dec.

DIRECTORY COMMANDS: All the routines are self explanatory, just follow the screen prompts. A word of caution, if you select option 4 (Write a no directory load) do NOT attempt to read the directory from within the utility on the disk that you place to no load on. If you do the utility program will lock up.

DISKETTE CHECK: This routine simply writes to each track of the disk, reads it back then erases it again. This just checks that the disk is performing properly

DISK COMMANDS: These allow the user to perform various tasks without having the bind of opening and closing channels all the time. Similar to the standard DOS commands.

DISK FILE LOCATE: Unlike myself, some of you do not keep good housekeeping of your



disk files. This could prove a godsend. You may have say a couple of hundred disks with say a couple of thousand programs on them. Let's say that you don't keep track of where each program is. Then trying to find one particular program can be very time consuming and very trying. This little routine will take all the drudgery out of the task for you. Just tell it which program you want and it will find it for you.

DRIVE SPEED CHECK: As the title suggests, this routine checks the running speed of your drive, which should be in the region of 298-301 revs per minute. If the speed is way out, I suggest you don't try to adjust it yourself as you can very easily damage the drive mechanism. Take it to an authorised dealer or repairer. At least you will have the satisfaction of knowing what the problem is.

ERROR CHECKER: This routine simply reads the tracks of your disk and reports any faulty tracks back to you.

FILE COPIER: This a a single file copier. It loads the required program into memory and then writes it back out to the desired disk. You may resave the buffer onto another disk. There is nothing fancy about the routine as is is only designed to back up your own software. Do not attempt to read a non-existent file, the program will crash if you do. The utility will have to be reloaded after using this routine.

HOR/ID CHANGER: Rename your disk headers and/or disk id's. This routine allows you to input up to 5 characters for the id, instead of the usual 2.

ID CHECKER: Sometimes when trying to read or load or even copy a program, you get a read error occur. On the surface all seems to be OK. This routine checks that the id on each track is the same as the id of the disk, reporting back any discrepencies.

M/C DATA MAKER: Convert machine code programmes into Basic DATA with header and line numbers. The routine works directly from disk memory so no loading or saving is required. Just type in the parameters asked for and sit back and wait.

M/C MONITOR: This is a full-blown machine code monitor for the more experienced users. However, I strongly urge novices and Basic programmers alike to use the monitor and to experiment with it. (This is how I first got into using machine code. It can prove to be very rewarding).

The commands that are supported will be at the end of the instructions chapter.

The utility will have to be reloaded after using this option.

MULTI SCRATCH: Instead of having to scratch programs one by one, you can now scratch up to 144 files in one go. All you have to do is follow the on-screen prompts and the program will do the rest.

PROGRAM HIDER: The standard Basic program protect routine. Once selected, follow the prompts and finish up with your Basic programs protected from prying eyes. The main utility will have to be reloaded after using this option.

PROGRAM TOOL-KIT: This tool-kit appeared in the November 1986 edition of Your Commodore. But I feel that it is still a very useful program to have, so I have therefore decided to include it in this utility program. Full instructions on the commands available will be reproduced at the end of these instructions.

PROTECT FILES: Protect those valuable files from accidental erasure, and then unprotect them once you have finished with them.

READ SEQ FILE: This routine reads any sequential file you want and outputs it to either the screen or printer, without reading it into memory first. (Therefore you can quickly check up for that missing file, without disturbing memory).

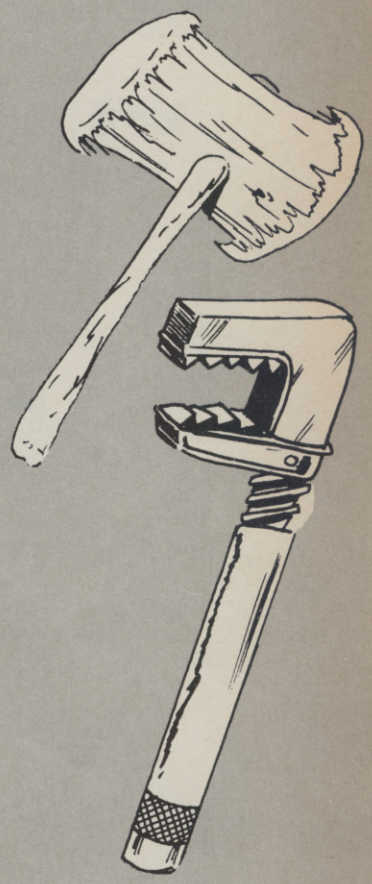
UNSCRATCH FILES: Recover that file that you scratched and now discover you need. Will recover any type of file providing the disk has not been written to since its last validation.

W/P DISKETTE: Run out of protect tabs? Then just run this routine and you can put a 'Software' write protect on your disk. This protection acts in the same way as a tab, except that you can still re-format the disk. Use the unprotect option to revert the disk back to its normal state.

X-RAY FILES: Instead of just reading the directory, why not read all the parameters of a file? Name, Load address, Open or Closed, Protected or not, Blocks in length, is it PRG, REL etc etc.

CHANGE COLOURS: Simply change the Border, Background and Text colour as and when you feel like a change. (Not everyone agrees on the same colour schemes as myself, I find the greys kinder on the eyes over long periods).

1541 DISK EDITOR: The inexperienced should only experiment with this routine on disks that contin no valuable dta. You can Read blocks of data, modify them and then write them back to the disk. You can repair damaged tracks and sectors and play around with the directory and BAM. Full on- screen instructions included, so there is no need to expand on them here.



▶ ▶ ▶ ▶ ▶ ▶ ▶

PROGRAMMER'S TOOL-KIT COMMANDS AVAILABLE:

APP "program name", device: Appends one program onto the one in memory. Line numbers are not altered, so use RENUM after use.

AUTO first number, second number: produces automatic line numbering when entering Basic code. Pressing return after a line number on its own will cancel the AUTO feature.

B-D 8 bit binary number: produces the high and low byte equivalent in decimal. More than one number can be converted at a time. each one should be followed by a comma.
e.g. 1100000.0011111

CODE: renders those awful graphic commands into readable mnemonics. For example PRINT "(CLS) (YEL) (CUD)"

D-B decimal number: produces hex conversion of decimal number. Comma acts same way as for B-D.

DELfirst line (,last line): Deletes lines as given by the parameters. Acts in the same manner as the normal LIST command. If no second parameter given then it will delete the entire program from the first line given.

DERR: Will read the error channel and report result.

DIR(0 or 1): Will display directory of disk in drive (0 or 1)

DISK"command": allows easy disk commands to be sent over the command channel.

DUMP: Display variables currently in use.

H-D number (,number): Converts hex to decimal. Commas act in the same way as B-D.

HI address:- Will set the top of Basic memory to given address. (Must be in the range of 1024 to 40790)

KEY: Will display the commands assigned to each of the sixteen function Keys.

KEYnumber "command": Will re-assign a new command to given Key number. The command must be no longer than 10 characters. If a return is to be included in the command then place a back arrow after the command, but before the closing quotes.

LOaddress: This will set the bottom of Basic to the given address. Must be in the same range as HI.

MEM: Displays the amount of free memory left.

MERGE"program name",device: Will merge the given program with the one in memory. Line numbers of the incoming program have priority over the one in memory should they have the same line numbers.

MLOAD"prog name" ,dev,sa,eat1 : Enables any area of memory to be saved.

OFF: Disables the function Keys. Any Key command re-enables them.

OLD: Recovers a Basic programme after a new or system reset.

PAUSE: Activates the 'pause listing' routine. When a program is listed out, the space bar will pause the listing.

QUIT: Disables the tool-kit. SYS49152 reactivates.

RENUM line number from, increment, new start number: Renumbers the program from the first parameter given. If thefirst number is 0 then the whole program is renumbered. ALL GOTOs, GOSUBs, IF-THENs, ON GOTOs, ON GOSUBs are renumbered.

TRACE: Allows a diagnostic trace of a basic program as it is running.
(Caution:-do not type TRACE if you do not have a Basic program in memory at the time. The toolkit will crash if you do).

TROFF: Turns the trace command off.

M/C MONITOR COMMANDS

A :- Assemble code
B :- Set break point
C :- Compare memory
D :- Disassemble code
E :- Examine memory
F :- Fill memory
G :- Execute from given address
H :- Hunt through memory
I :- Interrogate memory
J :- Jump to subroutine at given address
L :- Load program into memory
M :- Display memory
O :- Turn off printer command
P :- Turn on printer command
R :- Display register contents
S :- Save memory
T :- Transfer memory
V :- Verify memory
W :- Walk or Trace through memory
X :- Disable monitor
@ :- Disk commands
@# :- Give start and end addr of given program
:- convert decimal to hex
$:- convert hex to decimal

When loading or saving then the device number should be 08 or 01 and not just 8 or 1. In all circumstances the delimiter between expressions can be either a comma or space. eg:- T 0800,0900,1000 is the same as T 0800 0900 1000

The 'load' is a relocatable load. Therefore you can load into any area of memory specified in the load command. eg:-.L"PRG",08,0900 will load PRG into memory starting at 0900.

Relocator

ON THE DISK

This compact but versatile program references the places that other utilities can't

By Fin Fahey

One of the really annoying things about working with certain assemblers, Zeus 64 being an example, is that there are a lot of really useful bits of memory where you simply cannot assemble code. This is usually quite simply because the assembler, and frequently an associated monitor, are sitting there.

In the case of Zeus 64, which I use, these inaccessible areas comprise the whole of shadow Ram, and the useful little chunk of memory between $COOO and $CFFF. One way around the problem, of course, is to assemble code to another area and change all references using a monitor, one by one.

This is a tiresome task, so I've written Relocator to automate it. You can use this program for other purposes, too. Besides relocating the program, it can also be used to alter all program references to any area of Ram, and can be included in your own code, so that this can be made self-modifying.

This saves putting extra program logic in to enable a routine to determine, for example, which of two tables it is using. The whole routine can simply be altered by its external controlling routines to fit the data area you want.

Using Relocator

Relocator sits at $9000(49152). The stand-alone program is entered by SYS49152 from Basic, though it is recommended that you use it in conjunction with a monitor (resident at $C000). You will find a machine-code monitor on this issue's disk as a part of The Disk Toolkit. See the Toolkit article for details of how to use the monitor.

The program first asks for the beginning and end addresses of the code to be modified. These must be entered in hex format (leading zeroes are not necessary).

Next, you are asked for relocation parameters. These parameters tell Relocator the range that a reference must fall in, in order to be modified. Ordinarily, if you just want to relocate a bit of code, these will be the same as the beginning and end of code, so you will just press Return in each case.

There are two reasons why the relocation parameters might differ. If the code you are modifying contains data, Relocator might just by accident modify this, if some of it happened to look like a valid machine code instruction. To get around this, the relocation parameters should be set to cover both code and data, while the beginning and end of code will just refer to executable machine code.

Secondly, you may simply want to alter references to data outside the code block entirely. If so then relocation parameters don't have to bear any resemblance to the code limits.

The last parameter the routine asks for is the address you want the code relocated to.

A Warning

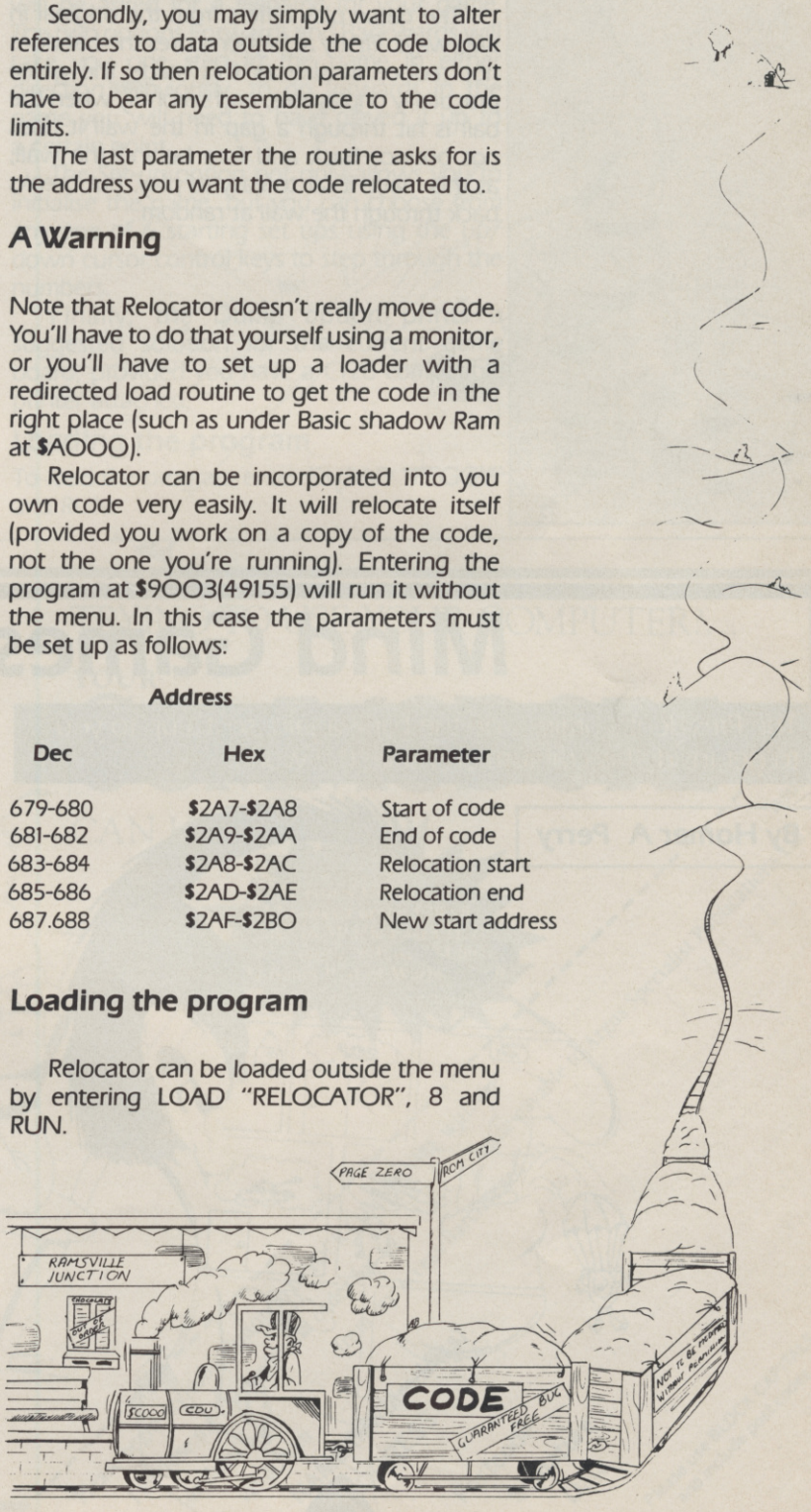
Note that Relocator doesn't really move code. You'll have to do that yourself using a monitor, or you'll have to set up a loader with a redirected load routine to get the code in the right place (such as under Basic shadow Ram at $AOOO).

Relocator can be incorporated into you own code very easily. It will relocate itself (provided you work on a copy of the code, not the one you're running). Entering the program at $9OO3(49155) will run it without the menu. In this case the parameters must be set up as follows:

Address		
Dec	**Hex**	**Parameter**
679-680	$2A7-$2A8	Start of code
681-682	$2A9-$2AA	End of code
683-684	$2A8-$2AC	Relocation start
685-686	$2AD-$2AE	Relocation end
687.688	$2AF-$2BO	New start address

Loading the program

Relocator can be loaded outside the menu by entering LOAD "RELOCATOR", 8 and RUN.

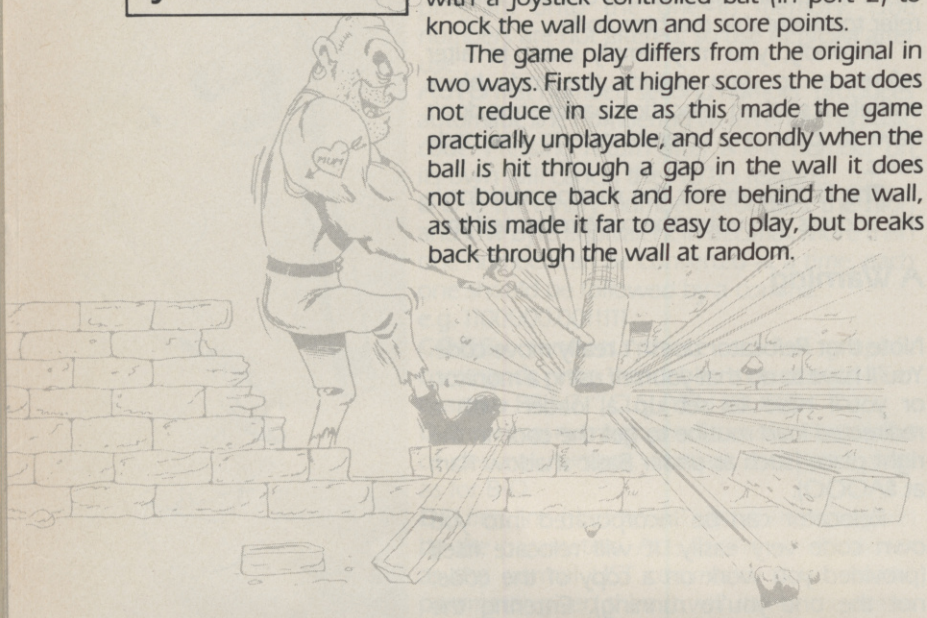


ON THE DISK

3-D Breakout

Surely not Breakout again? But have you ever played it in 3 dimensions before?..

By Malcolm Gallon



This is a 3-Dimensional version of the old game of Breakout, with the wall being in the distance and the ball apparently moving in and out of the screen. You simply have to hit the ball back towards the wall with a joystick controlled bat (in port 2) to knock the wall down and score points.

The game play differs from the original in two ways. Firstly at higher scores the bat does not reduce in size as this made the game practically unplayable, and secondly when the ball is hit through a gap in the wall it does not bounce back and fore behind the wall, as this made it far to easy to play, but breaks back through the wall at random.

The game gradually speeds up as you score more points until it is played at twice the starting speed. The speed increases occur at 400, 800, 1200, 2000, 4000 and 10000 points, and if you can get to that stage you must have faster reactions than me. You start off with 3 balls (if you'll pardon the expression) and for every 1000 points scored you get another life. Also when you have completely cleared the screen you will get a bonus of another 3 lives up to a maximum of 9 lives.

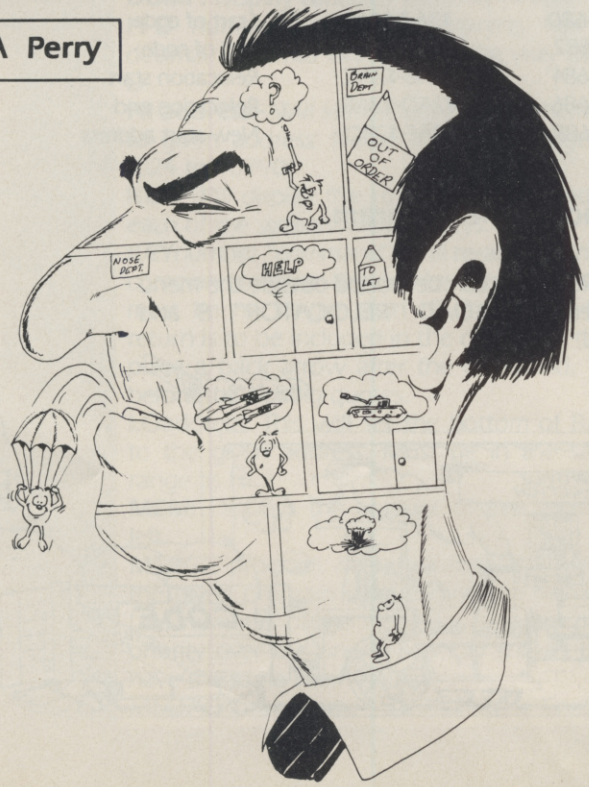
If you fancy a break from Breakout then the game can be paused by pressing any key, and restarted by pressing the space bar. To start a game or to restart a game if you should happen to miss a ball then simply press the fire button on the joystick.

The main program is stored in memory between $0898 and $16AF for those that wish to disassemble it, with the music files at the end of those memory locations. The screen data and colours tables are stored between $1700 and $1FFF. The redefined character set is at $2F00 and $2800- $2FFF and the sprites are stored between $2F00 and $3380.
To load the program outside the menu type LOAD "3-D BREAKOUT",8,1 then RUN.

Mind Games

The President's brain is on the blink again, so it's up to you to get inside his cranium and save the world

By Homer A Perry



A summit conference of the world's two military giants is scheduled for tomorrow, but for no very good reason the US president has gone totally insane. Well, not totally insane; one coherent idea remains alive deep within his subconscious.

It is your mission, should you accept it, to guide this small bubble of sanity through the labyrinth of the president's mind, destroying insane thoughts and opening the Doors of Reason. Ultimately you must find the exit from his subconscious and enter the President's conscious mind, restoring his sanity.

The president's subconscious is made up of a 10 x 16 grid of 256 rooms. Each room is full of insane thoughts which must be blasted. When a certain number of thoughts have been destroyed (this number is different for each room) the Doors will begin to open. The player can then pass through these into the next room, until the EXIT is reached, and sanity restored.

Loading the program

To load the game outside the menu, enter LOAD "MIND GAMES" and RUN.

Peggy 128

C128 software is usually a very serious business. To lighten the atmosphere, here's that rare animal, a C128 game

ON THE DISK

Peggy is a super deluxe version of an old favourite - Solitaire. Besides full joystick control, this version allows you to save and load part-finished games and features six different game boards.

For the uncertain, a 'cheat' facility is supplied which allows you to step backwards and forwards through a game, and the program will actually supply you with a complete solution to the game (output to printer) if you give up.

The object of the game is to clear a board filled with pegs of all the pegs save one. Pegs are 'taken' in a fashion resembling draughts by jumping other pegs over them. Unlike draughts, permissible takes are not diagonal, but must be along rows and columns.

How to play

The program represents the solitaire pegboard as a number of orange pegs on a blue background. To pick up a peg, position the flashing crosshairs on it and press the trigger. The crosshairs will stop flashing. Then to jump the peg, move the stick right, left, up or down. If the move is permissible, the peg will jump two spaces and another peg will be removed from the board.

The main menu

Below the game board, you will see a horizontal menu. This is accessed using the left/right cursor control keys and the return key is used to select an option.

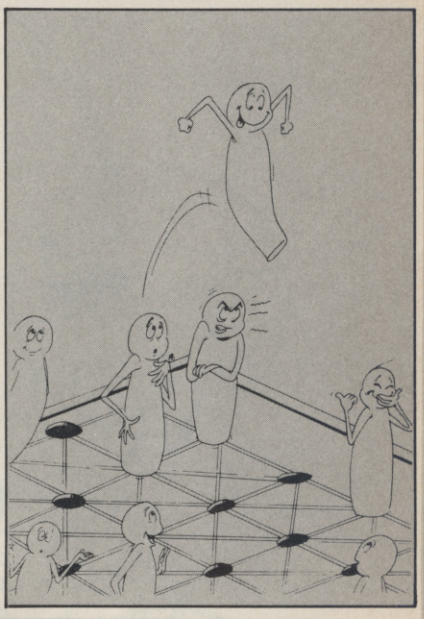
Load and save are self-explanatory - you will be asked for a filename for your game. The two options Forwards and Backwards will take you one step in the game in either direction. Obviously, to go forwards in the game you will need to have played it up to a certain point.

The Set-up option not only allows you to initialise the game, but you can choose from any one of 6 starting set ups using the up/down cursor control keys to step through the numbers.

Finally, the Dump option prints a suggested solution for the current game board, provided you have a C128-compatible printer attached.

Loading the program

To load the program enter DLOAD "PEGGY" and RUN.



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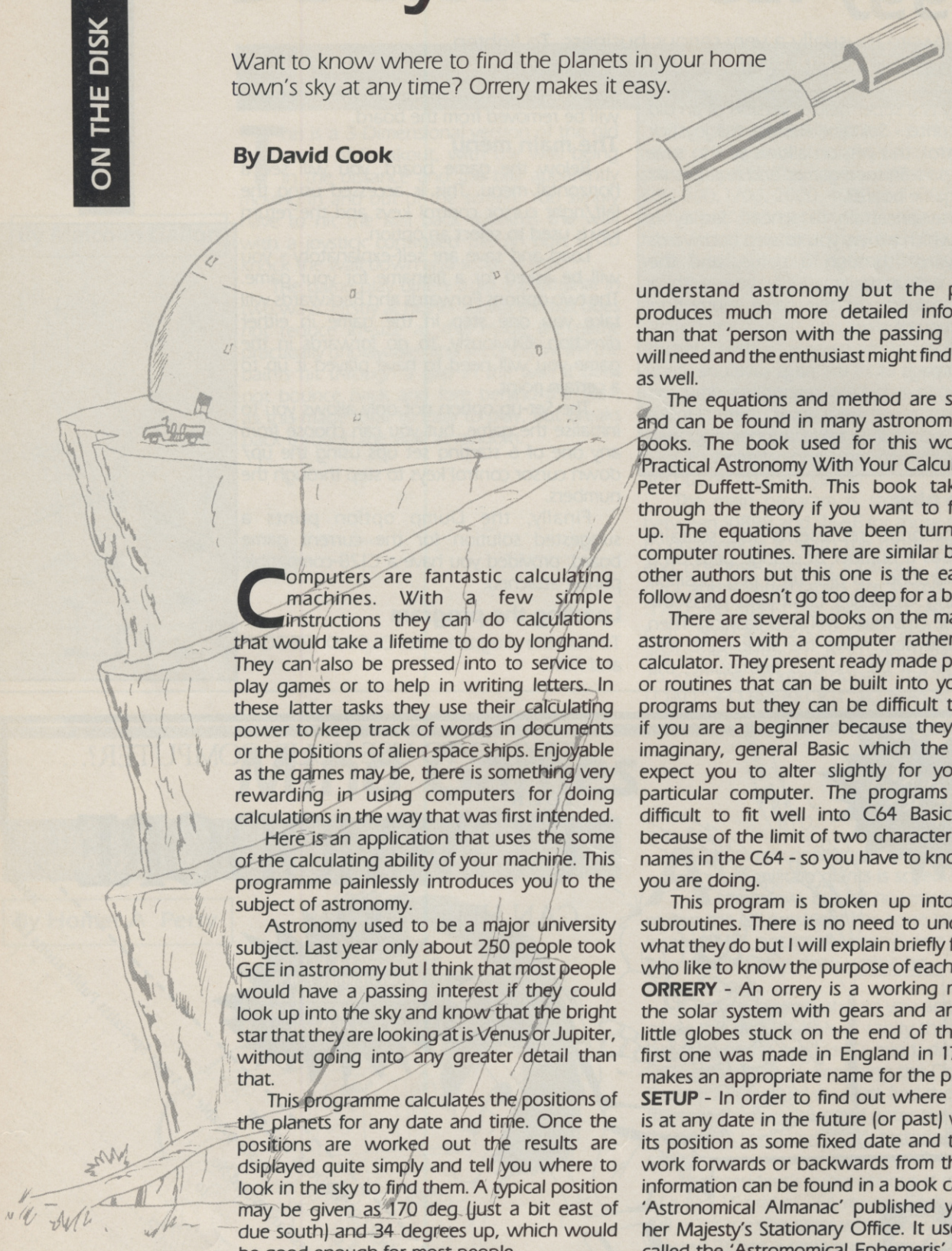
Orrery

Want to know where to find the planets in your home town's sky at any time? Orrery makes it easy.

By David Cook



Computers are fantastic calculating machines. With a few simple instructions they can do calculations that would take a lifetime to do by longhand. They can also be pressed into to service to play games or to help in writing letters. In these latter tasks they use their calculating power to keep track of words in documents or the positions of alien space ships. Enjoyable as the games may be, there is something very rewarding in using computers for doing calculations in the way that was first intended.

Here is an application that uses the some of the calculating ability of your machine. This programme painlessly introduces you to the subject of astronomy.

Astronomy used to be a major university subject. Last year only about 250 people took GCE in astronomy but I think that most people would have a passing interest if they could look up into the sky and know that the bright star that they are looking at is Venus or Jupiter, without going into any greater detail than that.

This programme calculates the positions of the planets for any date and time. Once the positions are worked out the results are dsiplayed quite simply and tell you where to look in the sky to find them. A typical position may be given as 170 deg (just a bit east of due south) and 34 degrees up, which would be good enough for most people.

With a program like this, there is inevitably a load of maths. None of this has to be understood to use the program and I will not explain any of it, but it is all easy stuff. By far the most complicated parts of the program are the bits that arrange the results on the screen. The calculations themselves are quite simple. Neither is there any need to understand astronomy but the progam produces much more detailed information than that 'person with the passing interest' will need and the enthusiast might find it useful as well.

The equations and method are standard and can be found in many astronomical text books. The book used for this work was 'Practical Astronomy With Your Calculator' by Peter Duffett-Smith. This book takes you through the theory if you want to follow it up. The equations have been turned into computer routines. There are similar books by other authors but this one is the easiest to follow and doesn't go too deep for a beginner.

There are several books on the market for astronomers with a computer rather than a calculator. They present ready made programs or routines that can be built into your own programs but they can be difficult to adapt if you are a beginner because they use an imaginary, general Basic which the authors expect you to alter slightly for your own particular computer. The programs can be difficult to fit well into C64 Basic: mainly because of the limit of two character variable names in the C64 - so you have to know what you are doing.

This program is broken up into several subroutines. There is no need to understand what they do but I will explain briefly for those who like to know the purpose of each routine.

ORRERY - An orrery is a working model of the solar system with gears and arms with little globes stuck on the end of them. The first one was made in England in 1713. This makes an appropriate name for the program.

SETUP - In order to find out where a planet is at any date in the future (or past) we need its position as some fixed date and time and work forwards or backwards from then. This information can be found in a book called the 'Astronomical Almanac' published yearly by her Majesty's Stationary Office. It used to be called the 'Astromomical Ephemeris'. Some of the data here are from the Duffit-Smith book but as my copy is eight years old, it has been mostly updated from the 1988 Almanac. There are also a few constants defined here and the data for the KEY to the results display. It is a trivial side issue but the program will tell you the day of the week for any date. You can find out the day of the week that you

were born. That is why the days of the week are listed in the DATA statements.

CO-ORDINATES - If you look up at the sky from different places in the world there is a different scene. You might be seeing Jupiter in England but the Sun is shining in Chicago. The program is written for Leeds, England but there is the option to change it for a different latitude and longitude. You do not need to be too smart to put your own co-ordinates in and cut out this routine. The professional astronomer would give the position of the planets in a scientific way that doesn't matter where on Earth you are but for anyone with passing interest, the most important information needed is 'how far up and which direction'. To get that we need to know where we are on the Earth. Another niggle with C64 Basic is that angles have to be in radians and not degrees for calculations. The program sorts all that out. When you see RD in the program it is there to convert between degrees and radians and back.

DATE and TIME - Here we enter the time of interest. The routine is more complicated than it need be so that the values can be entered as decimal hours or normally as hours, minutes and seconds. You have to use the "*" instead of ":" in the time because BASIC V2 doesn't like ":" in INPUT statements. I have also included a system of default values so that if you change the day for a further calculation, the program will remember the year and month from the previous entry and they don't have to be entered again. There are endless opportunities for simplifying this program. I have left it as it ended up so that I don't make mistakes changing it for this magazine. If you know Basic, you will easily pick out the bits that can be dropped.

JULIAN DAY - We have leap years and different numbers of days in the months so astronomers convert the date to a day number called the Julian day. They work out how a planet has moved from the starting reference day number when its position is known, to the day of interest as it moves in its orbit. The reference date for this program is the begining of 1988. X6 in this routine is the day of the week 0=SUNDAY 1=MONDAY etc. If you decide that you aren't interested in astronomy after all you can pack up here with something to show for your work. (Add a PRINT D1• statement and an END statement before the GOSUB to the next subroutine). If you enter your date of birth it will tell you what day it was.

As a matter of interest, the day number 1 for astronomers started at noon on January 1st 4713 BC. They had to start counting from somewhere! Since then there have been going on for two and a half million days. They also start the year from January 0th!

The program also takes account of the ten days lost in 1582 when Oct 5th to 14th were missed out of the calendar because the date was getting out of step with the seasons. There were riots when people thought that their lives had been shortened.

SIDEREAL TIME - Most people think that the Earth turns once in 24 hours. Wrong! It goes once round in 23 hours and 56 minutes. A day is 24 hours of course because we think af a day in terms of how long it takes for the Sun to do a circuit of the sky. Because the Earth goes round the Sun as well as turning on its own axis, it has to revolve once plus an extra 4 minutes on average to get the Sun in the right position to call it a day. Sidereal time means time by the stars. Look at the stars three hours apart and they will have moved a good way across the sky but every 23 hours 56 minutes they will be back in the same place.

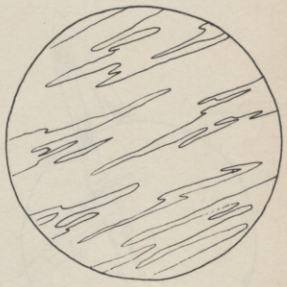
OBLIQUITY - is the tilt of the Earth's axis that gives us the seasons. Some calculations in this programme are included for completeness and were written for the author's own education They are not really necessary for the accuracy we need here. This is one of those calculations: x1=23.45 would have been enough. There are also many other routines that could have been included to refine the whole programme but I haven't got that far myself yet.

ANOMALY - Now we are getting to the astronomy. This is an astronomical term for the angle of a point on an elliptical orbit. The routine pinpoints the planet on its orbit around the Sun. The position of all the planets are calculated, including Earth.

JUP/SAT PERTURBATION - This is another unnecessary bit, unless you are travelling far into the past or future. Jupiter and Saturn are very large planets and they have a marked gravitational attraction for each other and pull each other slightly out of position. All planets have similar slight effects but they can be ignored for our calculations. Neptune was discovered by its tiny tugging on Uranus. First the position was calculated by the stray movements of Uranus and then the astronomers looked in the calculated place and found it. Serious, accurate work uses 160 terms in the equation to pinpoint where Jupiter and Saturn were in the the year 1600, for instance. There is no chance of checking the sunrise over Stonehenge with this programme because the Earth has been tugged about too much.

RADIUS VECTOR - calculates the distance from the Sun. This program refers to distances in kilometers or 'astronomical units'. An AU is the average distance of the Earth from the Sun.

HELIOCENTRIC ECLIPTIC position - The orbits of the planets are tilted to that of the Earth's orbit about the Sun. This routine finds

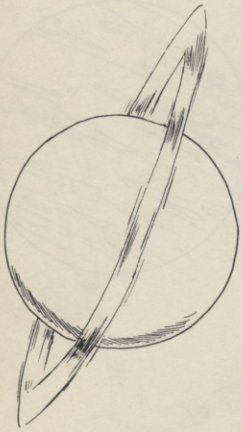


► ► ► ► ► ► ►

out how far above or below the Earth's orbit the planet is at our particular date. The ecliptic is the name of the plane of the Earth's orbit. Heliocentric is Greek for 'Sun Centered' so this is the planet's position as seen from the Sun.

GEOCENTRIC ECLIPTIC position - We now know where all the planets are with respect to the Sun and the Earth's orbit. Now we need to calculate where they are with respect to the Earth so we can eventually find their positions in the sky.

ECLIPTIC TO EQUATORIAL position - The sky is like a big globe with the Earth at the centre. The stars seem to be stuck to the inside surface. This globe has an equator just like the Earth's and astronomers refer the positions of stars to one spot on the imaginary line of this equator. This spot is called the 'First point of Aries' or the vernal equinox. For non-astronomers it is the position of the Sun amongst the stars on the first day of Spring (March 21st). It seems an odd arrangement because you can't see the stars with the Sun shining but...



SOLAR ELONGATION - works out how close the planet is to the Sun in the sky. If the planet is in line with the Sun it obviously cannot be seen. Mercury is always hard to see because it is never very far from the Sun in the sky and it only makes a brief appearance just before dawn or after sunset at the best of times. It is said that the great astronomer, Kepler, never saw Mercury. The rest of the planets are continually varying with respect to the Sun as they move in their orbits but beyond Saturn thay cannot be seen without a telescope.

HORIZON CO-ORDINATES - These are the positions that we have been working for. The astronomer's positions are not much good to ordinary folk who do not know where the first point of Aries is. What we need is the direction to look now and how far up. Thoughout the night, the stars are slowly swinging round the sky, just as the Sun does during the day. This routine works out where to look to see the planets at our date and time. The direction is measured in degrees from North going around like a compass. North is 0 (and 360), East is 90, South is 180 and West is 270.

RISE AND SET times - This routine calculates the rise and setting time for each planet. As the sunrise and sunset are given you can judge what chances there are to see the planets.

PRINTOUT STRINGS - These routines chop the numbers up into convenient lengths for a good display. If you are only interested in the 'how far round - how far up' the rest of the display can be ditched. The technical terms for the position described in this way are AZIMUTH and ALTITUDE. If the altitude is displayed as negative it means that the Sun or planet is below the horizon and can't be seen.

MENU - Dates and times can be changed. Different displays can be presented, including useful, intermediate data produced in the calculations. There is even a very coarse map.

Overall the program is short on accuracy but it is quite good enough for a guide. This is mainly because the reference positions soon get out of date. There are so many wobbles and meanderings of the planets which are not allowed for here. If nothing else, this program gives a greater appreciation of the skill of the astronomers long gone who had no computers but who could predict positions to greater accuracy than this.

15/6/1988 0GMT 17=33=58GST WEDNESDAY DAY NO. 2447327.5
THE POSITION OF THE PLANETS FROM LEEDS
LAT=53.85 LON=1.53 DEC-DEG

	AZM	ALT	RAZ	SAZ	RSE	SET	DIST
SUNG	1	-13	48	312	3.6	20.4	1.02
MER1	4	-17	56	304	3.9	19.7	.55
VEN2	5	-14	51	309	3.6	19.9	.29
MAR4	102	-2	105	255	.4	10.7	.82
JUP5	34	-13	59	301	2.1	17.5	5.82
SAT6	176	14	130	230	20.6	4.1	9.03
URA7	176	12	133	227	20.8	3.9	18.27
NEP8	166	13	130	230	21.3	4.8	29.25
PLU9	229	27	89	271	15.2	3.3	30.17

AZIMUTH: Which direction to look
ALTITUDE: How high in the sky
RIGHT ASCENSION & DECLINATION: The scientific positions
HOUR ANGLE: How far the planet is from due south
RADIUS VECTOR: The distance of the planet from the sun

Key to Printout

AZM=AZIMUTH
ALT=ALTITUDE
RAZ=RISING AZIMUTH
SAZ=SETTING AZIMUTH
RSE=RISE TIME (DECIMAL)
SET=SET TIME
DIST=DISTANCE FROM EARTH IN AUS
DIS-KM=DISTANCE FROM EARTH IN KMS
RETASC=RIGHT ASCENSION
DECLIN=DECLINATION
MRA=HOUR ANGLE
SEL=SOLAR ELONGATION
RVC=RADIUS VECTOR
ORB-LO=ORBITAL LONGITUDE
HEL-LO=HELIOCENTRIC LONGITUDE
HEL-LO=HELIOCENTRIC LATITUDE
GEO-LO=GEOCENTRIC LONGITUDE
GEO-LA=GEOCENTRIC LATITUDE

Message Construction Kit

ON THE DISK

Scroll it in style with this versatile display program

By Gary Saunders

Message Construction Kit is a program for people who may want to turn the '64 into an message display. A message can be entered using the keys and then be scrolled across the screen in big style letters. Various different effects can be added to make the message even more impressive! For example, you can flash it, have it scrolling at different speeds, vary the letter size, and you can even scroll a background within a background!

Five different style fonts together with ten background characters are available for your preference. Messages can be up to 4800 letters (or 4.8k) in length and they can be typed in by pressing (1) on the menu screen. Press (2) to scroll and edit your message. Pressing (3) or (4) will save the completed message to either tape or disk so that it can be used independantly from the editor program. All messages created wrap around.

Your message can now be loaded from tape or disk using one of the following commands:

LOAD"PROGRAM NAME",8,1 for disk
or
LOAD"PROGRAM NAME",1,1 for tape
and then started with SYS 32895.

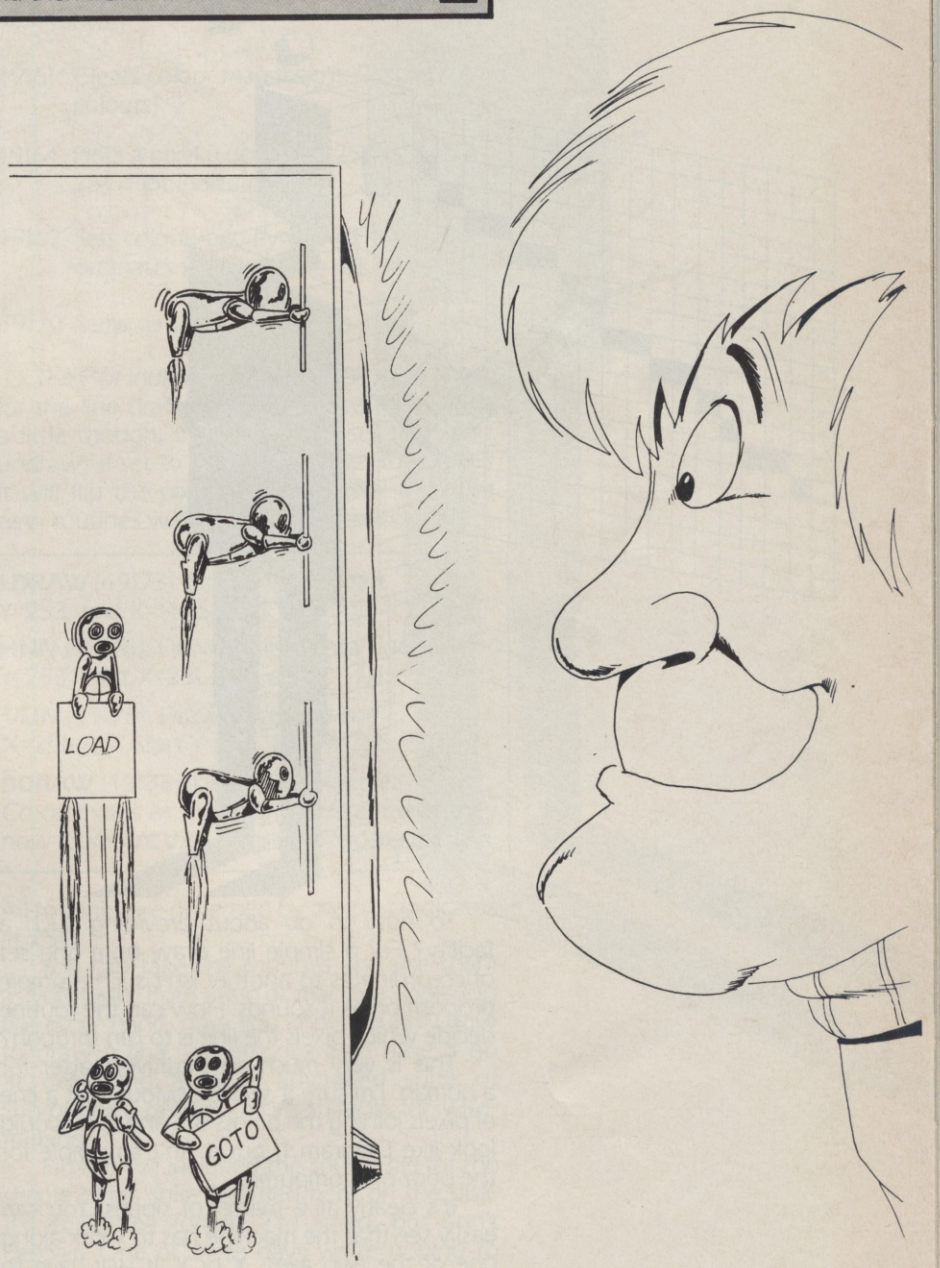
Essentially, MCK was designed as an advertising tool but it can also be used as an intro for a game or even to send someone a greeting on Compunet.

MCK Control Keys

F1: Letter colour
F2: Flash letter colour on/off
F3: Background colour 1
F4: Flash background colour 1 on/off
F5: Background colour 0
F6: Flash background colour 0 on/off
F7: Shadow colour
F8: Border colour
+: Increase scroll speed (4 speeds available)
-: Decrease scroll speed
S: Small size letters
M: Medium size letters
L: Large size letters
C: Change background character (10 available)
U: Scroll background chars up
D: Scroll background chars down
F: Change fonts (5 available)
X: Exit to menu screen

Pressing (2) as soon as the menu screen appears, displays a small intro message.

LOADING THE PROGRAM
To load the program outside the menu type the following:
LOAD"MSG CONSTRUCTOR",8
and then RUN.

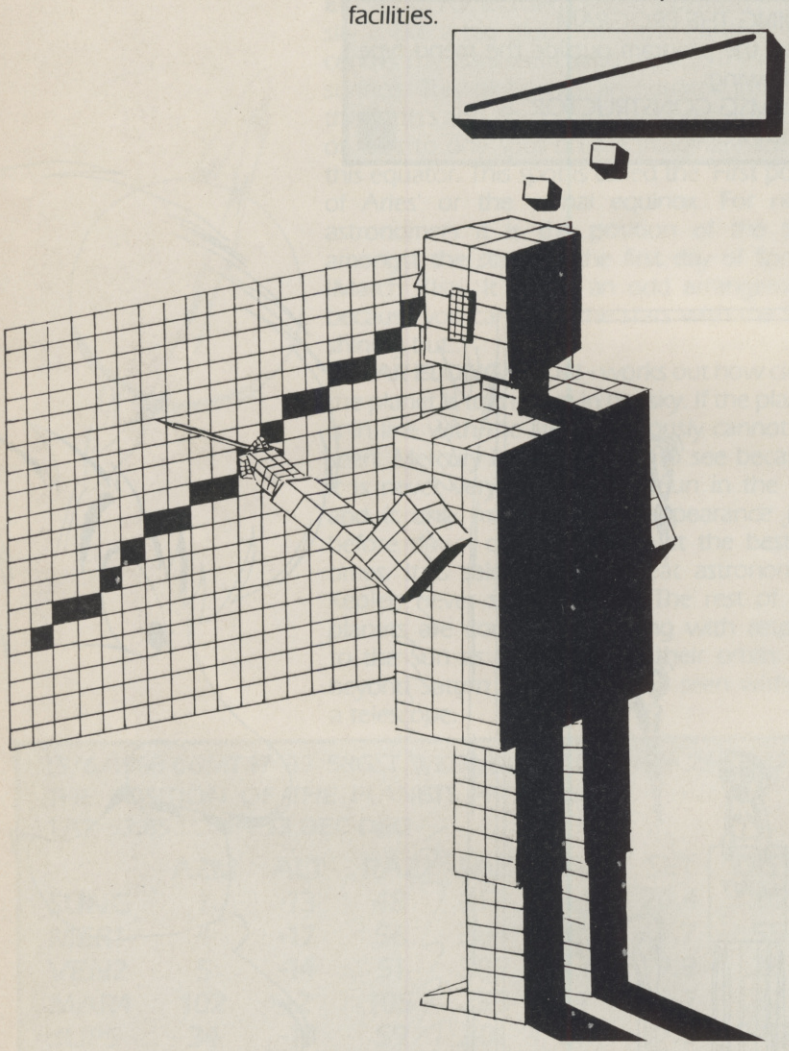


Getting your lines right

C64 Basic badly lacks high-resolution graphics routines. In the second of our hi-res features, we look at line drawing

By Gordon Davis

Drawing a line in high-resolution graphics is something that most machines will do with ease. A simple DRAW or LINE command usually suffices. Not so C64 Basic, with its deplorable lack of facilities.



So how to go about providing such a facility? For a simple line draw from one set of co-ordinates to another isn't such a simple proposition as it sounds. How can the routine decide which pixels the line is to run through?

This is very much an intuitive matter for a human. I'm sure it seems obvious that a line of pixels joining the points 3,5 and 7,12 would look like Diagram 1, but it isn't so simple for the poor old computer.

It's clearly all a matter of slopes. You can easily see that the machine has to work along one of the two axes, X or Y. It will have to plot a point for every unit of difference along that axis. But it also has to know when to make a jump along the other axis.

There are a number of ways around this, but the best method is to set up a constant known as a step evaluator. If the greatest of the two co-ordinate differences is called G and the lesser L, then the ideal initial step evaluator is equal to the greatest integer less than half G. Or, in not so plain English, (G/2-1).

Every time a point is plotted along the greater axis, we subtract the smaller difference L from the step evaluator S. If the result is negative, then we do a jump along the short axis. The step evaluator S then has to be reset. This is done by adding the whole of the greater difference to it.

This sounds complicated, but isn't really. It's just a way of encoding basic trigonometry in a way that can be handled fast, in a step-wise fashion, by machine code. If we step through the example line I showed before, you'll see how the results come out:

Line from 3,5 to 7,12

G: 7
L: 4
S(initial):3

S	Co-ordinate
3	3,5
-1+7=6 (jump)	4,6
2	4,7
-2+7=5 (jump)	5,8
1	5,9
-3+7=4 (jump)	6,10
0	6,11
-4	7,12

Stepping through the above example shows that what we are doing is establishing the ratio of greater difference to lesser. In the above example, rounded, it's 2, so we need to jump every two steps. However the above algorithm allows us to do two neat little half steps at the beginning and end of the line, which gives a much prettier effect.

Toeing the line

Of course, when it comes to producing a subroutine, that's not all. You have to know what direction you're stepping in. You might be incrementing, or decrementing, either X or Y. My favoured method of speeding this process up is to rearrange the co-ordinates so that you are always incrementing the greater of the two differences, while the lesser

of the two, you have to decide on. This saves on registers, and you can INC the difference on page-zero.

Then there are some edge conditions to be looked for. A decent subroutine will exit when the start and finish co-ordinates are identical for one thing. For another, one may quite often wish to draw a simple vertical and horizontal line in a speedy fashion. While the algorithm above will do this, it's a hell of a long way of going about it. The best idea is to have separate horizontal and vertical line routines, and filter out any situations where the X or Y co-ordinates are equal.

Finally, there's the tricky question of bounds checks. Obviously you don't want to attempt to plot a point off the screen. This may clobber some vital area of memory, for one thing. But supposing your screen is simply a small window onto a larger graphic plane (which is the way the Amiga looks at graphics). Then you will want to be able to calculate a pixel position on a line even if you don't actually plot it. Otherwise the bit of the line that appears on screen won't appear in the right place.

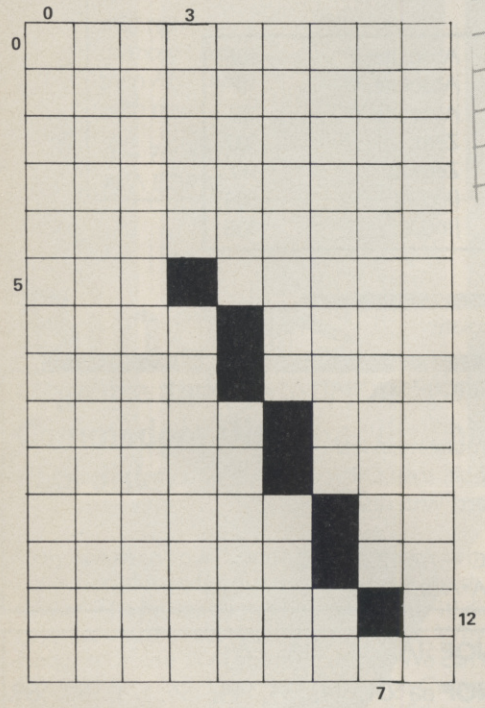


Diagram 1

For an example of how this can be necessary, look at a wire-frame program like Elite. For realism, the shapes have frequently to be seen partly on screen, which means that a great deal of this 'virtual plotting' needs to be done. Not only this, of course, but a different co-ordinate system from normal needs to be applied.

The art of compromise

Don't worry about it. I've supplied a relatively simple line drawing routine which you will find on the disk. It uses the normal boring C64 co-ordinate system, and checks that both end points are on screen, just so you won't get into trouble. If you want a super-sophisticated line draw routine, you'll have to design it yourself. So now you see that it is important to know how the routine works.

Since the routine also contains horizontal and vertical line routines, I've provided entry points for these. And since we have these, it may have occurred to you that a simple box routine would be a good idea, so I've added that too. The new routines go together with the point plot routines I featured in the last issue, which can be summarised as:

Entry Function and parameters

49152 Initialises hi-res

49155 Returns to text mode and clears screen

49158 Clears the hi-res screen (Locns 2=clear byte)

49161 Clears colour map (Locns: 2=screen colours)

49164 Plots a pixel (Locns: 251-252=X 253=Y 254=Plot indicator)

49167 Sets colour map byte form hi-res co-ordinates in 251-253 to value in 2

49170 Same as last two routines in one.

The Plot indicator, location 254, also holds for the line draw routines. I have modified it a little though. It still draws if set to 1, and undraws if set to 0, but now if set to -1 (255) it will flip the pixel value (Exclusive-Or). The new routines with parameter locations are:

LDRAW (49173): Start X=-252, Start Y=253, end X=14-15, end Y=255.

HLIN (49176): Draws a horizontal line. Y=253, Start X=251-252, end X=14-15.

VLIN (49179): Draws a vertical line. X=251-252, Start Y=253, End Y=255.

BDRAW (49182): Draws a rectangle. Co-ordinates as for LDRAW, except that they now represent the values for opposite corners.

All routines are governed by the plot indicator at 254.

You can take the routines and use them as you wish, from Basic or machine code. On the other hand, now you know roughly how to draw a line, you may care to have a go at designing a more advanced suite of subroutines, perhaps more suitable for wire-framing.

Finally, I've included the source file for the simple hi-res suite featured here on the disk. It's in Zeus64 format, I'm afraid, but don't despair. One of these days we're hoping to bring you an assembler interconverter so you can use it with the other popular development systems.

Hidden Secrets of the 6510

There may be more to your C64 than meets the eye

By Al Dukes

Have you ever felt a little restricted because the Commodore 64 has only 56 machine-Language instructions? Well worry no more, because hidden in the darkest depths of the 6510 live quasi op codes.

As you will see from the table, there are a number of these Quasi op codes and not all of them are guaranteed to work on all versions of the computer, though software has been published using them. The ones that are least reliable are the ones that use: Absolute,Y; Zero page,Y and Indirect addressing (with both Y and X indices).

Quasi op codes are used by the C64 in the same way as normal op codes, but aren't mentioned in many of the programming guides or books that have been published up to now. Because of this, the mnemonics are NOT included in most assemblers and monitors. For example, to use one of these op codes, using the Commodore Assembler, you'll have to use the .BYT statement: if I wanted to use absolute ASO, then I would have to type .BYTE $0F, address the instruction is to be performed on in low byte, high byte order.

Eg: .BYTE $0F,$00,$40 performs ASO on $400. The following tables show the characteristics of the various quasi-opcodes. Try them and see.

LAX (LDX,LDA)

	Absolute:	$AF
	Absolute,X:	$DF
DEC mem and	Absolute,Y:	$DB
CMP result	Zero:	$C7
with acc.	Zero,X:	$D7
	(Ind,X):	$C3
M=M-1	(Ind,Y):	$D3
A=M?		

ASO (ASL,ORA)

	Absolute:	$0F
	Absolute,X:	$1F
ASL then ORA	Absolute,Y:	$1B
result with	Zero:	$07
acc.	Zero,X:	$17
	(Ind,X):	$03
C ←76543210 ←0	(Ind,Y):	$0B

STZ Absolute: $9C

Store 0 in mem

M=0

ALR (AND,LSR) Immediate: $4B

AND acc. with data then shift right 1 bit

A=A AND M
A=0→ 76543210→ C

RRO (ROL,ORA) Absolute,Y: $3B

rotate mem left 1 bit, then OR acc. with result.

C ←76543210 ←C
A=A or M

INS (INC,SBC)

	Absolute:	$EF
	Absolute,X:	$FF
INC mem then	Absolute,Y:	$FB
SBC result	Zero:	$E7
with acc.	Zero,X:	$F7
	(Ind,X):	$E3
M=M+1	(Ind,Y):	$F3
A=A-M		

NOP $1A, $3A, $DA, $FA

NOP aa $04, $14, $34, $44, $54, $74, $80, $89, $f4
Wait 2 cycles
Ignore next byte.

NOP aaaa $0C, $1C, $3C, $5C, $7C, $DC, $FC
Wait 3 cycles
Ignore next 2 bytes!

RLA (ROL,AND)

	Absolute:	$2F
	Absolute,X:	$3F
ROL then AND	Absolute,Y:	$3B
result with	Zero:	$27
acc.	Zero,X:	$37
	(Ind,X):	$23
C ←76543210 ←C	(Ind,Y):	$33
A=A AND M	Immediate:	$2B

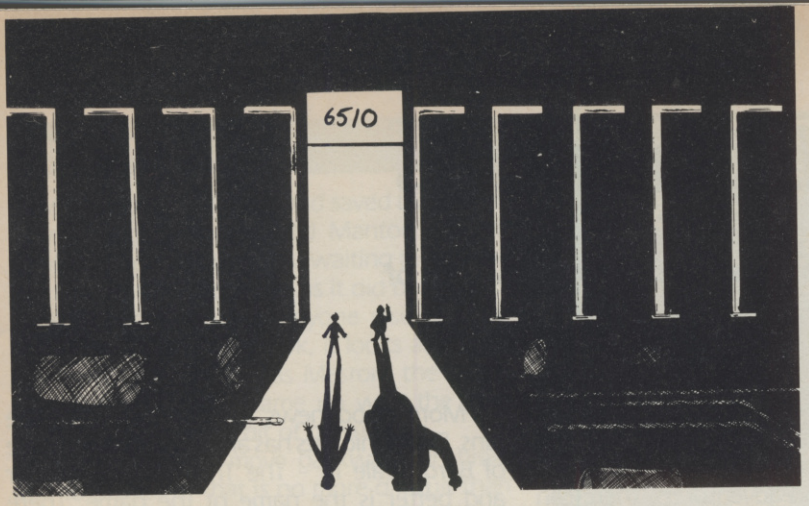
AXS (STA,STX)

	Absolute:	$8F
	Zero:	$87
Store result	Zero,Y:	$97
of A AND X.	(Ind,X):	$83
M=A AND X		

SAX (DEX,CMP) Immediate: $CB

SBC data from A AND X: store in X.

X=(A AND X)-M



ARR (ROR,ADC) Immediate: $AB

AND acc. with data and rotate right 1 bit.

A=A AND M
A+C→ 76543210 → C

OAL (TAX,LDA) Immediate: $AB

OR acc. with # $EE, AND result with data, then TAX.

A=A ORA $EE
A=A AND M
X=A

TAD (TXA,AND) Absolute: $8B

Put X in acc. then AND acc. with data.

A=X
A=A AND M

RRA (ROR,ADC)

Absolute:	$6F
Absolute,X:	$7F
Absolute,Y:	$7B
Zero:	$67
Zero,X	$77
(Ind,X):	$63
(Ind,Y):	$73

rotate right memory 1 bit then ADD result to acc.

C → 76543210 → C
A=A+M

LSE (LSR,EOR)

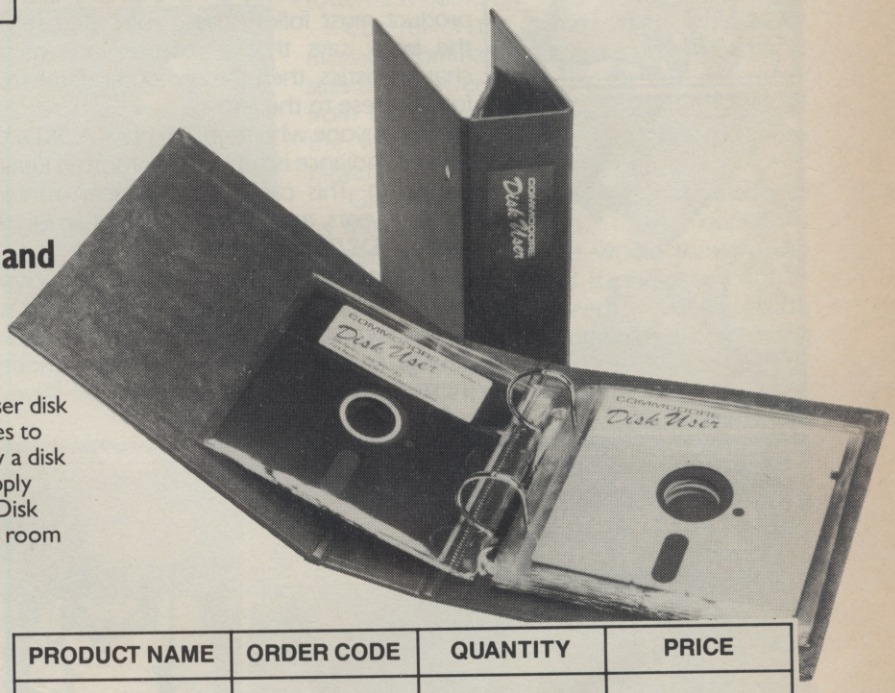
Absolute:	$4F
Absolute,X:	$5F
Absolute,Y:	$5B
Zero:	$47
Zero,X:	$57
(Ind,X):	$43
(Ind,Y):	$53

shift right memory 1 bit then AND acc with result

0 → 76543210 → C
A=A EOR M

Binders

Organise and protect your disk with Commodore Disk User disk binders and data disks.



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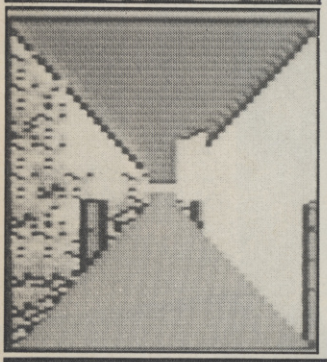
PRODUCT NAME	ORDER CODE	QUANTITY	PRICE
Overseas postage add £1.00			
		TOTAL	



Disk Dungeons

Grontol tells the latest tales from the world of adventuring

The forthcoming launch of Dungeons and Dragons from SSI has got to be one of the major software events of the year.

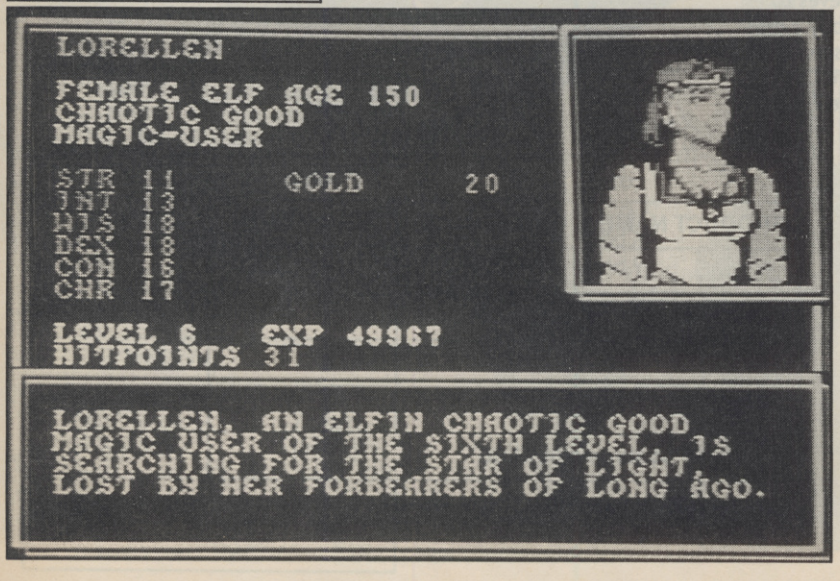
Even amongst non-adventurers, there can be few people who have never heard of D & D even if they know nothing about it.

Originating in the mid-seventies as a fantasy based wargame, this was the product that launched role-playing games on an unsuspecting public. From then on, as Topsy might have said, it just growed and growed. Today, TSR, the company behind D and D publish a plethora of manuals, modules, playing aids, boxed sets, books and artwork.

The SSI title, Pool of Radiance, is based on the Advanced Dungeons and Dragons system (AD&D). This is 'advanced' not in the sense of more difficult, but more structured than the original version. Tables of rules and probabilities exist for just about every sort of activity imaginable - combat, magic, different character classes, movement, encumbrance and so on and so on. One thing that TSR is particularly strong on is that any licensed product must follow these rules precisely. If the book says that a monster has certain characteristics, then the computer game must follow these to the letter.

For anyone who regularly plays AD&D, the Pool of Radiance is set in the Forgotten Realms campaign. This campaign has been running for ten years and is now the basis for the official AD&D game world.

Pool of Radiance is the first in a proposed series and should be released in the States in the summer of this year. The UK release date is not yet known so in the meantime these shots from the demo disk will have to suffice.



More good news for role playing game fans. Electronic Arts has announced the release of Bard's Tale III - The Thief of Fate. Bigger and better is the name of the game. There are more spells (over 100) and monsters (over 500) to battle against. The game will play faster than its predecesor too, one of the major criticisms levelled against Bard's Tale I & II.

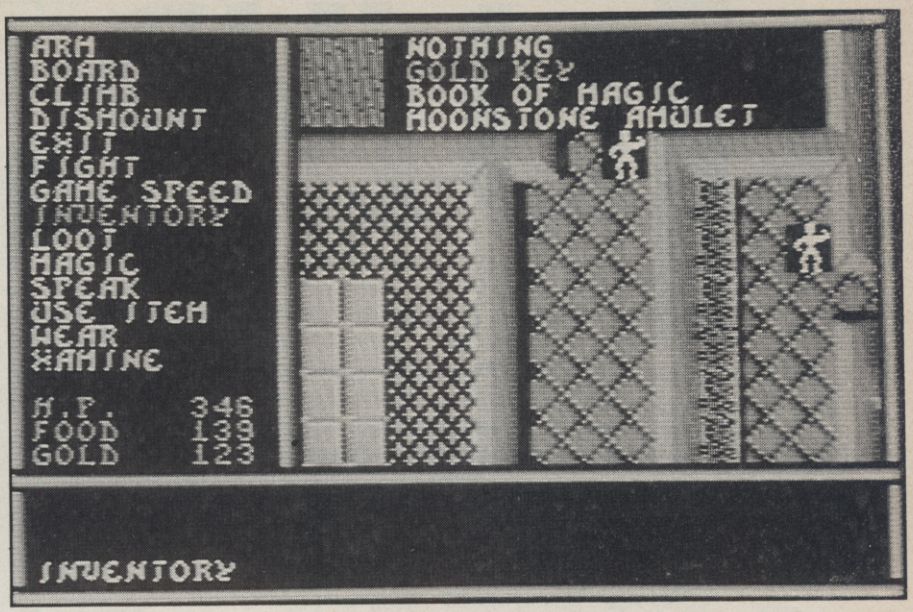
After the evil Mangar has defeated (BT II), Mangar's master, the even more evil Tarjan has arrived on the scene. (Can you imagine how evil the baddy in Bard's Tale LXXXVII is going to be?!) Determined to seek his revenge, he has reduced the town of Skara Brae to rubble and is now going on a destructive tour of other cities in the land. As

you and your merry band of travellers pursue Tarjan, so you will have to find and fight your way through 84 different dungeon levels spread throughout 7 different dimensions.

Meanwhile, for those of you still struggling in the lower reaches of Bard's Tale I & II, help is at hand. Clue books are available from Electronic Arts price £5 each. This might seem a lot but you do get beautifully produced books for your money giving maps of all the dungeon levels and showing the location of all the important objects. A running commentary gives you some idea of what sort of things you should be trying to do.

If you are one of that rare breed of adventurer that can map perfectly in 3-D first time round and whose corridors always join up on their graph paper, you might have little use for the books. If you are still stuck on a particular problem though, EA are also offering a telephone advisory service. What help you get depends on how well you cast your benevolence spell.

Questron II



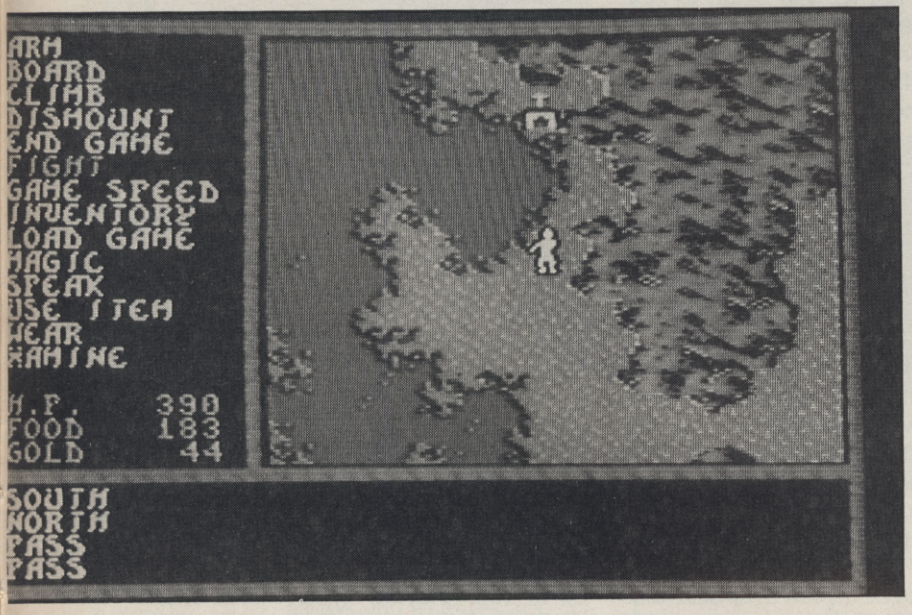
And you thought you had saved the world. Even though you defeated Mantor, his evil book of magic still remains, waiting to corrupt the land of Questron, just as it did before.

As neither you nor anyone else has the power to destroy the book, it looks as if your quest was in vain. It was Mesron, the Great Wizard himself who came up with the plan although you took a bit of persuading.

If you were to move backwards in time, and to a wizard, that is no more difficult than teleportation, you can make sure that the book is never created in the first place! The fabric of time is self-repairing and the past cannot be changed. Only the future can be changed.

What all this weird and wonderful storyline means of course is that you can start the game from the position of rank beginner as it were. Because you are in a different time, a different place, your skills and titles gained from Questron I are negated and you have to start again as a complete novice.

Questron II is notably expanded from the original. The same rules of combat and exploration still apply but there is an auto-mapping routine when in the dungeons or tombs. There are two continents to explore on foot, by sea, by llama and even by air if you can persuade a passing eagle to give you a lift.



Over sixty different monsters inhabit the land although each type stays in its own particular terrain – mountains or swamps etc. Amongst the vile creatures you will encounter are gypsy imps, antisaurs, vipods, jelly nymphs, hell hulks, disembowellers and churl ogres. You will find that certain weapons work best against different monster types so carrying a selection might prove to be advantageous. On the other hand, remember the old motto. He who turns and runs away lives to fight another day!

In the towns, you can pick up provisions, armour and gossip. Weapons are only made available to you when you prove your worth so to start with, only a dagger is available to you. You will have the opportunity to gamble (several different games) and bank any winnings – very useful in case you get killed and have to be resurrected. The money is still in the bank.

Other places to explore include cathedrals and castles. Redstone Castle is especially useful as it is here that you will need to make contact with Mesron who can keep you informed as to what is going on.

Control of the game is very simple. All available commands are listed on the left hand side of the screen and can be selected either from the keyboard or via a joystick. I found the former method to be infinitely more playable.

Graphically, the game looks much the same as the original although with the dungeons tarted up a bit. On the whole though, the images look crude. This is one area of role-playing games currently undergoing something of a transformation with SSI being one of the worst culprits.

Questron II is at the easier end of the role-playing game market with an estimated playing time of 30 to 60 hours. Certainly, it looks to be the poor relation when compared to say the Ultima, Bard's Tale or Alternate Reality series. Having said that though, it could appeal to younger players or newcomers to this genre who could play the game in the knowledge that there are bigger and better things to aspire to.

Title: Questron II
Supplier: SSI/US Gold, Units 2/3 Holford Way, Halford, Birmingham B6 7AX.
Tel: 021-356 3388
Price: £19.99
Graphics: Studded armour rather than gleaming plate mail
Sound: Nothing much for a Bard to sing about
Playability: Very easy. You don't have to be Merlin
Addictiveness: You will want to complete the quest

MUD

Mud, mud, glorious mud,
Nothing quite like it for soothing the blood,
So follow me follow,
Down to the hollow,
And there let us wallow in glorious mud!

I suspect that Flanders and Swann probably weren't talking about computer games when they penned those lines many years ago, but they are somehow appropriate. Many adventurers have heard various tales about MUD or multi-user dungeon but only a relative few have actually sampled its delights. Until now that is.

The idea of MUD was first dreamed up and implemented at Essex University. The idea was to extend the scope of the traditional adventure game by letting several players compete simultaneously. The players could, and did, interact freely with each other. Some problems required the help of other participants if you were to progress further within the game. All was not sweetness and light though as killing an opponent in combat gave the victor a substantial share of his enemy's experience points.

Collect sufficient experience points and you could eventually attain the exalted rank of wizard (or witch). This gave the player all sorts of special abilities, not least in being to help or hinder other players as they saw fit. This in turn gave the wizards some incentive to carry on playing after they had substantially completed the game.

The problem with all this was that the game had to be run on the university's DEC 10 computer which in turn meant that anyone wishing to take part in the game had to have access to a modem. Not many people did and there was also the other slight problem of parents objecting to astronomical telephone bills.

All that has now changed with the release of Micro Mud from Virgin Games. The game is contained on two disks and the only real difference is that instead of playing with and against fellow humans, Micro Mud selects ten characters at random from a disk containing one hundred such personae.

The game itself is big. There are some four hundred locations to be explored, all described at reasonable although not exorbitant length. There is actually a reasoned rationale behind all this. Whereas detailed atmospheric descriptions would be lovely, the authors decided that it would be a bit unfair if a player was to be attacked and killed when he was only half way through reading a page of text! There are 112 creatures (known as mobiles) to meet in the course of the game as well as over 250 objects to be found and used.

For that is another feature of MUD. The game plays in real time. So while you are sitting around trying to decide what to do next, the other players within the game are continuing about their business. There is a famous example here. When you jump off the cliff, assuming that you are holding an appropriate device, the trip takes about eight seconds. Without the necessary equipment, your journey is much quicker!

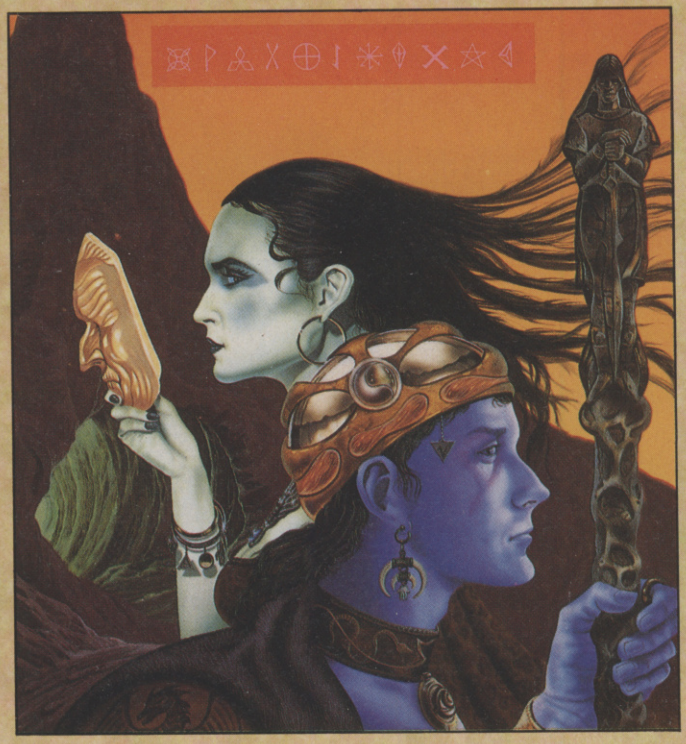
As already mentioned, the object of the game is to reach the rank of wizard. This requires you to score no less than 102,400 experience points – no easy task. Points can be obtained in three different ways. Performing certain mundane tasks will bring in but a few points. These tasks are easy but not particularly satisfying. The second way is to find some treasure.

To score points for collecting treasure, it has to be safely deposited. At the bottom of the swamp! Because the amount of treasure is limited, and there are ten or so players, the game resets every forty to sixty minutes (real time). Any treasure at the bottom of the swamp is returned to its starting location. The swamp incidentally has another use within the game. It is actually a large maze. Obviously, the traditional method of mapping mazes by dropping items in each location is not going to work here. The only things that don't sink are players so you might have to start getting friendly with a few of them or bribing them heavily.

The final source of experience points is via combat. The winner of any battle gains one twelfth of his opponents points. The only problem with combat is that once you start, there is no stopping and someone has got to be a loser. Combat is determined according to three characteristics that are established when you enter the game. Strength determines the amount of damage that you can do. Dexterity governs how well you can wield your weapon and stamina is a measure of how much damage your body can sustain. The fourth attribute normally associated with these role playing type characteristics is intelligence. How high that is depends on you!

Should you be killed in battle, you are dead dead. There are two ways of dying in MUD. Dead dead is for ever. You character is removed from the disk and you must start again from scratch. If however you do something stupid such as leaping, unprepared off the aforementioned cliff, you become dead. This just kicks you out of the game losing all points and treasure collected in that session but keeping your character intact for further expeditions.

The parser is perfectly adequate for the



MUD

game. Four word commands such as OPEN DOOR WITH KEY will cover just about everything that you want to do. As an added bonus, most of the commands can be abbreviated to save time. This is especially useful for running away before being attacked. Commands can be linked together using 'and' or 'then'. There are over 160 commands. The other characters have a vocabulary of about 500 words.

The function keys act as predefined commands. At the start of the game, they correspond to 'command', 'level', 'help' and 'info' but you might find it more useful to redefine them to such phrases as 'attack' or 'flee'.

Magic plays an important part in the game and a number of commands relate to spell casting. Anybody can attempt any spell that they want to with the warning that you might need to be a certain level or use a specific object before it will work. There might well be some sort of backfiring effect if you should get too big for your boots.

Amongst the spells are Finger of Death which instantly kills any known wizard; cripple, blind or deafen a player stops him from moving, seeing or hearing. Resite can teleport you whilst snoop allows you to eavesdrop on somebody else.

It is worth your while finding out who is present when you enter the game. You never know when you will need their help. The 'shout' command allows you to broadcast your message throughout the land. With a bit of luck, some people might even reply. Some of the characters' names give the lie to their previous adventuring experience or literary tastes. Thus you might meet Frobozz of Zork fame or Belgarion from the books by David Eddings. If you do persuade someone to help you, it is customary to reward them in some way. Failure to do so might result in a Finger of Death or similar being pointed in your direction.

On screen presentation is definitely not MUD's strong point. The game is text only and no attempt has been made to make the screen look interesting. Everything is aligned to the left hand edge of the screen without even a single column margin. Nor are there any gaps between inputs.

The character interaction is also somewhat limited but the game could never hope to compete with human counterparts. Having said that though, I was impressed by what was there. This aspect of adventuring has certainly come a long way since Thorin used to sit down and sing of gold in the Hobbit. The game is very well presented off screen, coming complete with a manual and seprate book. For just under fifteen pounds, Micro MUD is an essential addition to all adventurers' game collections.

AT A GLANCE

Title: Micro MUD
Supplier: Virgin Games, 2-4 Vernon Yard, Portboello Rd, London W11 2DX.
Tel: 01-727 8070
Price: £14.95
Presentation: Excellent
Playability: Wiz is a long way off but I'll keep in there
Value: Full marks

PROFILE

Accolade Action

Accolade Software is the ultimate in All-American action. Tony Hetherington takes a deep breath and dives in

Accolade burst onto the computer screen for the first time in the early months of 1986. As the latest US Gold signing, it promised "realistic action and movie style graphics". Two years later, these promises have been delivered in a string of hits from Hardball to Comics and The Train to Card Sharks.

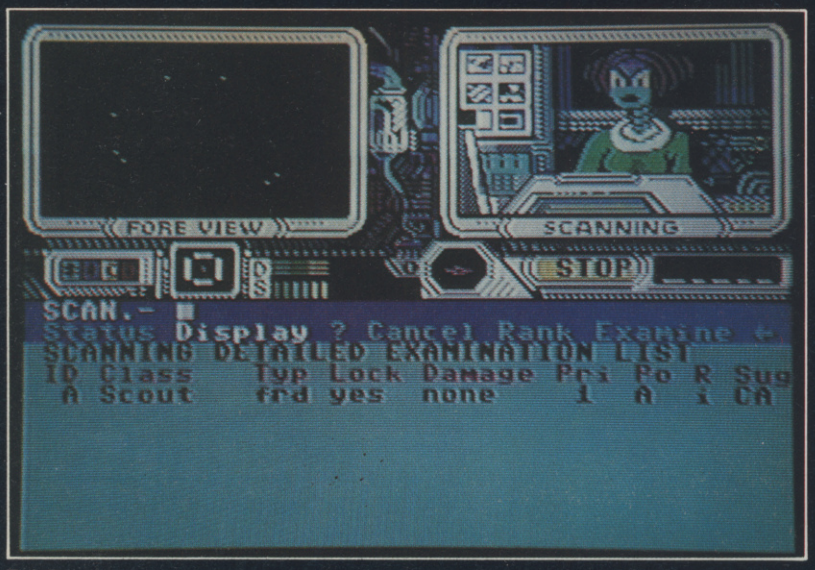
The hallmark of an Accolade game is a combination of superb graphics and joystick controlled gameplay. However, it never becomes the frantic joystick waggling of some games. Instead, you might have a joystick to carry out your moves but you needed your brain to plan them. It is this combination of strategy and action that has produced phenomenal success.

The original trio of games released through US Gold were Hardball, Psi-5 Trading Company and Law of the West. Hardball recreated the action of Major League Baseball and featured some impressive screens. The screen showing the pitcher waiting to throw anything from a curve ball to a fast ball to a waiting batsman could have been taken off a TV screen. Two years later and this is still the leading baseball game and remains one of my favourites that gets played regularly (usually when I should be working).

Hardball

It is only when the ball is hit and the screen swaps to the field that the game looks like a computer game. Unfortunately, Hardball was released just before World Series was shown on television so didn't get the accolade it deserved.

Psi-5 Trading Company was an excellent space trading game featuring superb graphics, a believable plot, a choice of twenty aliens to man your ship, a selection of cargos and destinations to take them to and a galaxy of pirates to rob you. Psi-5 was also one of the hardest games to pay and I doubt there was ever anybody good enough to tackle it.


FORE VIEW
SCANNING
STOP
SCAN.-
Status Display ? Cancel Rank Examine
SCANNING DETAILED EXAMINATION LIST
ID Class Typ Lock Damage Pri Po R Sug
A Scout frd yes none 1 A i CA
Psi-5

Law of the West was the most disappointing of the trio and despite some interesting characters that you met as sheriff of a small town the game was spoilt by repetition and poor gameplay. This proves that even a company like Accolade can produce a lemon and that you need more than great graphics to make a great game.

Ace of Aces was Accolade's first foray into World War 2 action that not only put you in the driving seat of a Mosquito fighter bomber but also at the navigation, main gun and engine controls. Armed with missiles and ammunition you were scrambled on a choice

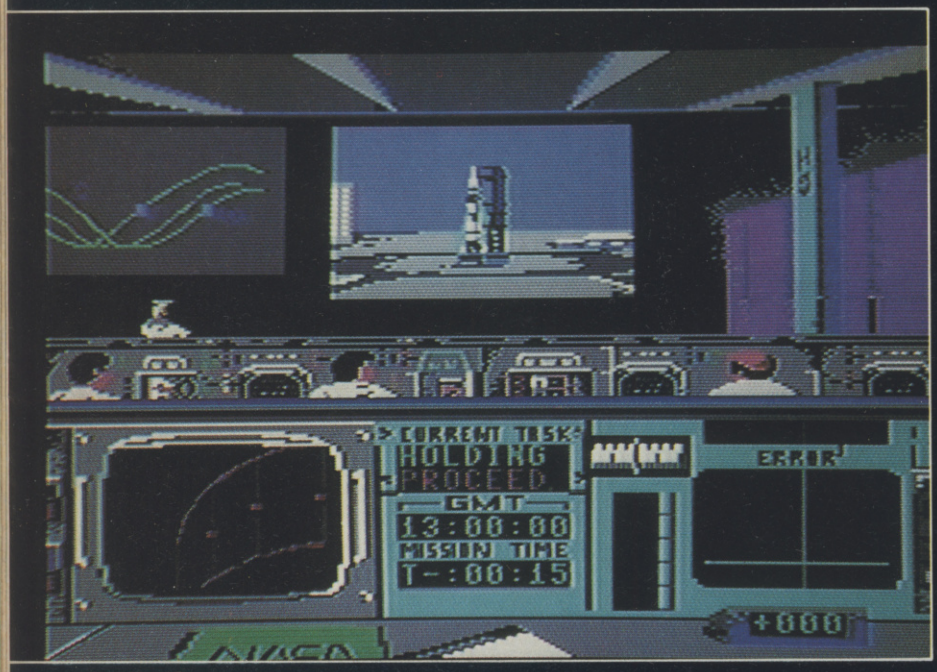
SALOON
YOU THE SHERIFF OF THIS STINKIN' TOWN?
YES, SON, AND IT'S A PRETTY NICE TOWN.
YES, WHAT MAY I DO FOR YOU?
WHAT'S IT TO YOU, PUNK?
YOU GOT A BURR UNDER YOUR SADDLE, BOY?
Law of the west

of four missions to either bomb a train carrying prisoners to Berlin, taking care to kill only the guards and not the prisoners, shoot down incoming enemy bombers, destroy V1 flying bombs on course for London, sinking submarines as they leave their pen or tackling all four at once to become an ace of aces.

Accolade's Comics has got to be one of the most original ideas for a game. Instead of computerising a comic hero such as Superman, Batman or the Incredible Hulk, Accolade computerised the comic itself.

NO KEENE! SEE THAT MAN ON THE COVER?
PROFESSOR ZORON FARAD, THE NOBEL PRIZE WINNER?
PRECISELY! HE'S A GENIUS, EVEN HIS COLLEAGUES CAN'T UNDERSTAND HIS WORK!
I BET HE WAS KIDNAPPED ON TUESDAY!
TUESDAY NIGHT PROFESSOR FARAD WAS KIDNAPPED!
SOUNDS LIKE A JOB FOR THE POLICE!
MAYBE, BUT RUMOR HAS IT THAT HE WAS FINISHING A MONDO BIG PROJECT.

Comics



Apollo 18

Test Drive, Apollo 18 and the Train were released early this year and gave you a chance to hurtle around test tracks in Ferraris and Porsches at a fraction of the cost, fly to the Moon in Apollo 18 or join the Resistance and escape from the Germans with a train full of art treasures.

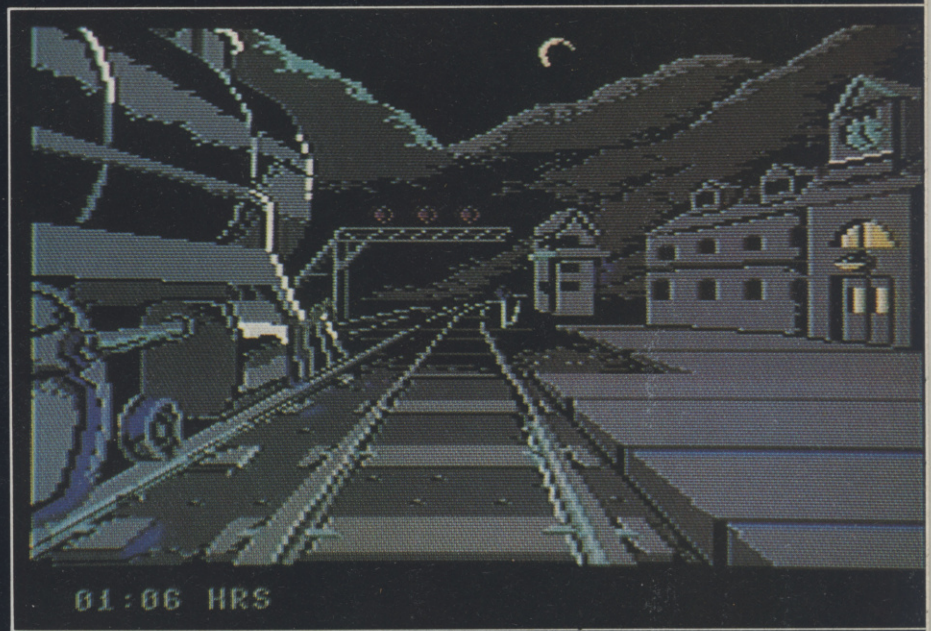
Apollo 18 is one of my favourites mainly because I used to stay up all night to watch every small step of the real Moon landings. Armed only with a joystick and your cool reactions you must complete each stage of the mission which begins on the launching pad, continues through tricky course corrections then onto the moon landing and finally re-entry and splashdown. Although each stage is a pure reactions test with any errors accumulating until you either complete the stage within allowed boundaries or the mission is aborted, it is backed up with speech commands from Houston Control (complete with static) and enough descriptions and graphic screens to make you believe you could be there.

Packed on three disks the comic you play plots the story of Steve Keene, thrillseeker and the spy that's too cool to fool. Called in to investigate the disappearance of a professor you meet villains that try to kill you, girls that are determined to avoid you and a killer vacuum cleaner.

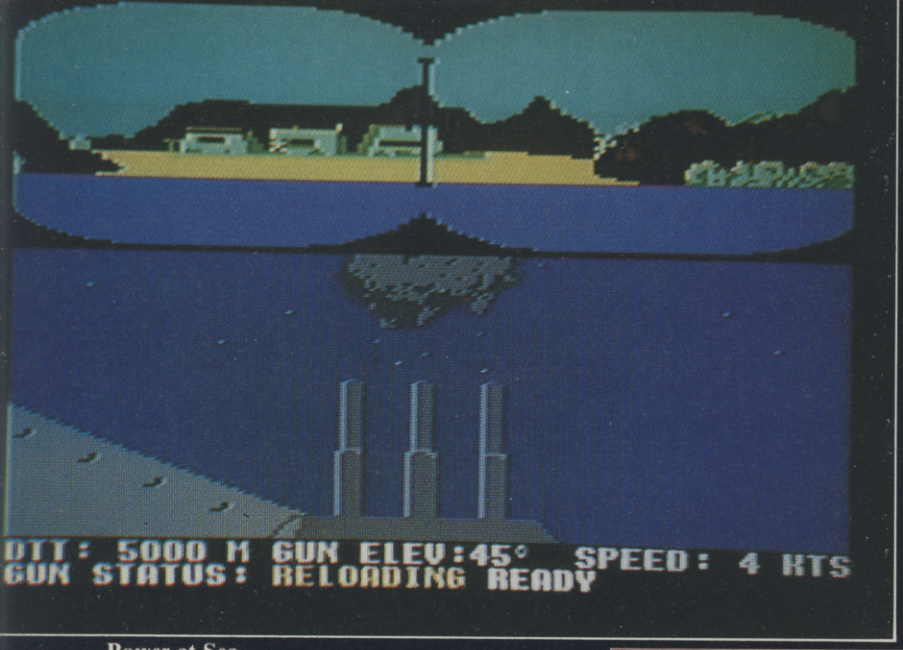
The windows of the cartoon scroll up onto the screen as the plot unfolds with speech bubbles controlling the dialogue. Through these you can decide what Steve Keene will say or do as he launches into attack or into another appaling pun.

Throughout the adventure you can save your efforts, which is essential, as at any minute you may be thrown into one of the eight arcade sequences as you fight for your lives in one of the villains death traps.

This idea will surely be copied by many and already no lesser company than the great Infocom has announced such plans.



The Train



Power at Sea

The Train demands a combination of strategy and arcade skills as you first hijack a train full of stolen art treasures and then embark on the long and hazardous journey to safety. On the way you will have to shoot down attacking planes, take stations so you can wire ahead if you need Resistance assistance and battle with ships that guard crucial bridges and keep the locomotive moving, stocked with coal and at the right temperature so you don't blow your chances by blowing the engine.

Power at Sea follows a similar format, only this time you're on the bridge of a warship commanding a fleet of three including an aircraft carrier and a troop ship with a mission to take for heavily defended Japanese islands. To complete the mission and raise the US flag on all four islands within the 12 hour time limit you must first plot your course on navigation screens and then defend your task force from air attack and battleships that have been sent to intercept you. To take an island you must first "soften it up" by taking out it's gun implacements with your 15 inch guns before sending in your troops. Mini pictures fill the screen showing the battle as they storm the beaches and then finally raise the flag.

4th and Inches is the pick of the American football programs that were launched in time for this years Super Bowl. The game borrows heavily from Hardball's game mechanics but includes all 11 players per side (most games struggle to get more than six a side on screen)

No Blitz ↑ Draw, Run 1st + 10
Lf Dog ← Quick Out, Pass 1st QTR
Mid Dog · Out, Medium Pass 4:40
Rt Dog → Corner, Long Pass ALL-PRO
Lf Blitz ↓ Streak, Long Pass CHAMPS

4th and Inches

Card Sharks

and enough play variety to keep even the hardened enthusiasts hooked until the last whistle.

Finally, Accolade's latest offering is a combination of Hearts, Poker and Blackjack called Card Sharks. Could you imagine a game of poker played between Reagan and Gorbachov or perhaps Mrs Thatcher? Well now you can even join in as they are just three of the six opponents you can play with. But beware, Gorby plays a mean game of poker.

Up to the beginning of this year Accolade's games were imported by US Gold but are now distributed as part of the Electronic Arts empire. However, if you wanted to track down one of the earlier games then watch this space as they're almost certain to appear in a compilation or as one of the many full priced games, now appearing at budget price. However, this new deal with Electronic Arts is even more interesting when you realise that EA and Accolade are rivals in the States!

Letters

Your chance to tell us what a great publication we are or not as the case may be...

Common complaints

A request for more C128 coverage isn't the only common plea from you readers...

Dear CDU,

Many readers may wish to keep their present and future copies of CDU. Can you please ensure that competitions, surveys etc. are printed on a page which has no textual matter on the reverse side so that no important material is lost when cutting out the coupon. You could use the other side of adverts.

I think the overall concept of the magazine, however, is excellent. But why not use both sides of the disk - one side could be used for the instructions for the games and utilities, leaving more magazine space for news and reviews.

You might be interested to know that I use my C64 for most of the time as a wordprocessor - I write letters to, and produce information sheets for, some of the many agoraphobics in the UK. I don't go in much for games, so keep the utilities coming.

Richard L King
St Ives, Huntingdon

Dear CDU,

Could you tell us in reviews whether or not the programs will load with different disk drives? Since subscribing to CDU I have purchased the 1541C. My previous drive was the Enhancer 2000, with which I had, regrettably, many compatibility problems.

A.K. Hardy
Immingham, South Humberside

We don't want to force readers to mutilate their copies of CDU, Mr King. We do our best to make sure that cut-out forms are printed on the back of expendable material, but it just isn't always possible. We can only suggest that readers facing this problem photocopy the page in question, and send that in instead.

As for the problem of program compatibility - this is a very hard one. We simply can't ensure that our reviewers have the range of disk drives needed to provide a broad enough test. We would like to assure everybody, however, that the programs on the actual CDU disk will load on any C64-compatible drive since we have eschewed the use of turboloaders. Perhaps in some future issue we will do a survey of programs which do, and do not, offer compatibility problems.

Shopping lists

A lot of readers have strong feelings about what they'd like to see in future...

Dear CDU,

Although I use my C64 mostly for number-crunching and wordprocessing, it is also shared by my sons. So the future software we'd like to see from your magazine includes adventure and arcade games for under-10s (we've all given up on educational software!).

A Basic renumber that copes with GOSUBs and GOTOs would be useful, together with a relocatable parallel interface and even a relational database (well, one can hope...)

Dr Gaden S Robinson
Upminster, Essex
Dear CDU,

I should like to see you feature a random-access disk filing system. This is something which can only be done with a disk drive, and is very difficult to program. Also how about some articles introducing machine code, raster-scan graphics etc. I'd also like to see more on role-playing games.

Finally, you could supply a public-domain programming language. I know for a fact that COBOL is available.

L.B. Lackett

Suggestions and criticisms are always welcome. As it happens, some of the ideas expressed in your letters (and there were many, many more) concur with the sort of programs we'd like to see. But bear in mind that our magazine is as good as the people who write for it - which means you lot out there. So when you've finished reading this letters page, turn to our page on 'How to contribute'. Think about it - if we publish your program, we even pay you.

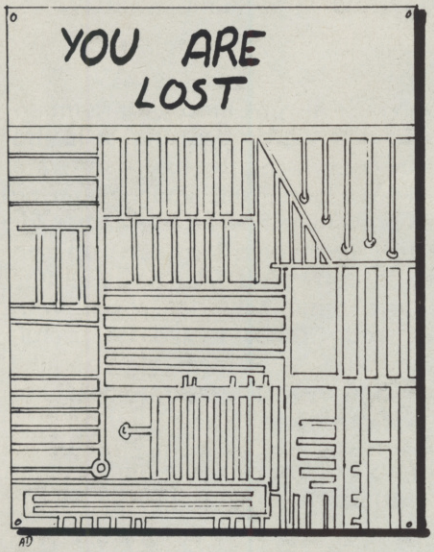
We do get it right sometimes. You'll find your renumber in this very issue, Dr Robinson. Public domain software is something of a problem. As far as we know, we cannot publish it, as this would involve us making a profit on the deal, which is expressly forbidden. Any readers interested in finding out about public-domain material should get in touch with a user group such as ICPUG (The Independent Commodore Products User Group).

Having said that - relational databases, computer languages, dungeon builders - nothing's impossible.

Mapping the machine

One of the virtues of the C64 is its incredibly flexible internal layout. Step this way for a quick guided tour

By Jeremy Cornell



If you're going to get the most out of your C64 at machine-code level, then you need to know the territory you're exploring. So we thought we'd take you for a quick ride around the C64's memory map. This is your chance to find out why so many machine-code programs are called with SYS49152.

One of the great things about the C64 is that you can get at almost all the 64k of addressable memory within the machine. But you need to know what you're doing. The diagram shows the main fixed features of the C64's memory.

If you are working in Basic, you don't have all the memory available. The bit you get is from 2048 to 40959 ($800-$9FFF). This is a bit inexcusable, because as you can see, there's a perfectly nice little 4k of Ram between 49152 and 53247 ($C000-$CFFF). It's rumoured that this memory was intended to be used to ensure that the C64 had a decent Basic rather than the dog's dinner it does have, but when the code got written, it got stranded.

Table 1: Vic-II memory banking

BANK NUMBER	STARTING LOCATION	VIC CHIP RANGE	LOC 56576 BIT SETTING
3	49152	C000-FFFF	00
2	32768	8000-BFFF	01
1	16384	4000-7FFF	10
0	0	0000-3FFF	11

Loadsofmemory

You can, of course, use it from machine code, which is why so many little utilities are called from 49152. Between this block and the Basic space is the Rom containing the dreaded Basic interpreter itself, from 40960-49151 ($A000-$BFFF).

It's not the most wonderful interpreter in the world, so if you are working from machine code, you might wish that there was some Ram there instead. Lo and behold, you can indeed switch out the Basic Rom, whereupon you acquire 8k of 'shadow Ram' (although it's as good as all the rest).

To do this, you have to manipulate one of the most important of the C64's page-zero locations, the On-chip I/O port. This is at the easily memorable address of 1. If you clear bit zero of this location, you will switch Basic out.

No loss, but the same location allows you to remove the second Rom area, known as the Kernal, by clearing Bit 1 to give you another 8k running from 57344 to 65353 ($E000-$FFFF), but here you need to be a little more careful.

Kernal contains a lot of routines that can be easily dispensed with, and that should more properly be part of the Basic Rom. It also, however, contains a number of more fundamental things. Some of these include I/O routines that you might want to use yourself from machine code to access tape and disk and output to the printer.

But you can always switch them in and out when you need to. The real danger lies in the C64's interrupt servicing routines.

A brief interruption

Your C64 is rarely being idle. In fact, every sixtieth of a second, an event takes place within it known as an IRQ interrupt. On an interrupt, the machine does such useful things as seeing if a key has been pressed, and updating the page-zero jiffy clock. There is another type of interrupt, known as an NMI, but this is usually generated by external events and is used by the operating system.

The main problem is that the machine jumps to part of Kernal on every IRQ, so if you want to use this part of memory, you have to either turn off all IRQs or provide new interrupt routines. You can easily turn off the interrupts by using the SEI instruction, CLI to restore them. In the interim, you can have

flipped Kernal out, used the Ram and flipped it back in again.

If you want to insert a new interrupt routine, the machine always goes on an IRQ to the address contained in locations 788-789. Remember to disable interrupts while you're changing this vector though.

It's commonplace to not dispose entirely of Kernal Rom, since its interrupt routines do lots of useful things, so most people end their interrupt routines with a jump to location $EA31, which is the usual interrupt routine. So that gives us lots of Ram, but what do all the other little bits do? Perhaps one of the most important areas is the 4k of memory from 53248-57343 ($D000-$DFFF). Depending on how you look at it, this block contains either all the data for the C64's two built in character sets, or the registers for the Vic chip controlling sprites, sound, I/O ports and more. Once again, it's flipped using location 1. Clearing Bit 2 of this will switch the character Rom in.

The machine normally switches the character set in and out without any help. However, it is handy to switch it in if you want to use the character matrices in hi-res graphics, or if you want to move them to another area of memory. As we will see, you can specify where the C64 looks for the matrices, which means that, if you put them in Ram, as opposed to Rom, you can alter the character set.

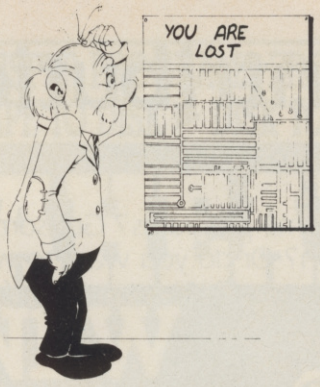
The Vic registers in this area cover a vast multitude of functions. Some of these are directly relevant to the way that the C64 looks at its memory. By altering locations in this area, you can put the C64's display screen almost anywhere you want in memory, and as we have seen, switch between alternative character set areas.

Banks for the memory

The Vic-II chip (it stands for Video Interface Chip) controls everything to do with the C64's graphics, both screen and sprites, plus sound. It's the graphics that concern us here.

Vic-II looks at the C64's memory space as 4 banks of 16k. The normal default graphics bank (Bank 0 is the bottom 16k of memory from 0-16383 ($0-$3FFF), and within this it locates the text screen at 1024 ($800). This screen can occupy the same relative position in any one of the other banks, however, if Vic was switched to Bank 1 which starts at 16384, the text screen would start at 17408. The bank switching is arranged by setting bits 0 and 1 of location 56576 and Table 1 shows the values needed to switch to each bank. Before the C64 banks are altered, by the way, you must set bits 0 and 1 of location 56578. This ensures that the Bank Control bits are read correctly.

That's not all. Within the bank itself, screen memory can be moved to a wide variety of locations. This is achieved by setting the top



four bits of control register 53272. Table 2 shows you the values you will need to OR this register with to get the location you want. Don't forget that 53272 should be cleared by ANDing it with $0F (15) first.

Changing character

As we have said, the character set can also be moved. Bits 1,2 and 3 of register 53272 control the location where Vic looks for character data as in Table 3.

You'll notice that the character set is 4k in size. It's actually two individual 2k character sets (8 bytes per character definition for 256 characters means 2k). The two sets, wherever they are in memory, are switched between by changing the three bits we've mentioned. Normally, as you'll have noticed, the system does this itself when you hit the Commodore and Shift keys together.

A couple of anomalies remain to be mentioned. The default case, where the characters are in fact in Rom at $D000 which is in Bank 3, actually has the three bits set for the equivalent position in Bank 1. This is a small kludge that the designers built in to harmonise the memory map, and only applies in this one case.

The other is that the text screen colour map never moves. This is always situated at 55296-56295 ($D800-$DBE7). It's almost reassuring to find something that doesn't alter.

If you bear in mind the principle of Memory Banking, you shouldn't go far wrong - you'll find it even applies to the high-resolution screens as well. So off you go - use your memory!

Table 2: Relocating screen memory

LOC 53272 BIT SETTINGS	SCREEN LOCATION DECIMAL	HEX
0000NNNN	0	0000
0001NNNN	1024	0400
0010NNNN	2048	0800
0011NNNN	3072	0C00
0100NNNN	4096	1000
0101NNNN	5120	1400
0110NNNN	6144	1800
0111NNNN	7168	1C00
1000NNNN	8192	2000
1001NNNN	9216	2400
1010NNNN	10240	2800
1011NNNN	11264	2C00
1100NNNN	12288	3000
1101NNNN	13312	3400
1110NNNN	14336	3800
1111NNNN	15360	3C00

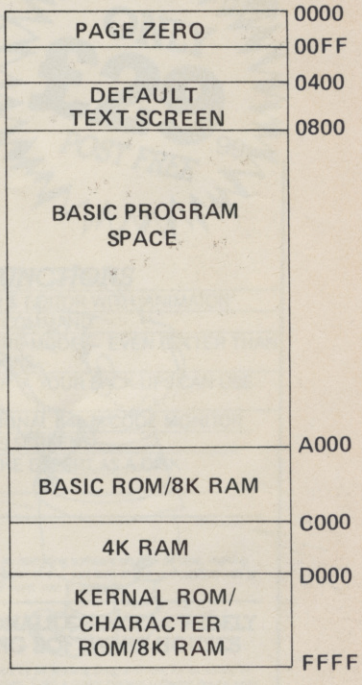
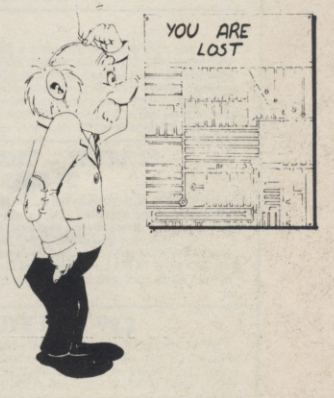


Table 3: Relocating the character set

LOC 53272 BIT SETTING	CHARACTER SET LOCATION DECIMAL	HEX
NNNN000N	0	0000-07FF
NNNN001N	2048	0800-0FFF
NNNN010N	4096	1000-17FF
NNNN011N	6144	1800-1FFF
NNNN100N	8192	2000-27FF
NNNN101N	10240	2800-2FFF
NNNN110N	12288	3000-37FF
NNNN111N	14336	3800-3FFF



Contributions

Written some programs? Got some programming wisdom to pass on? Or do you want to write about your own fields of interest? We're waiting for your contributions.

Commodore Disk User doesn't just offer you the chance of appearing in print, but of putting your programs on our disk for all to admire. We're always on the lookout for new programs for the disk. Anything goes, utilities, games or business programs in Basic or machine code - if we think it's good, we may well publish it.

Even if you haven't got a program to send, we'd love to pick your brains. If you have a field of expertise you'd like to explain or any tips and hints of interest to disk users, send them in.

But how do you go about preparing a submission? Just follow the guidelines and all should go well. You don't have to be a great novelist to contribute, but if you follow our simple rules then it will make our job a lot easier.

1) If possible all material sent to the magazine should be typed or printed out on a computer printer.
2) All text should be double-spaced, i.e. there should be a blank line between each line of text. You should also leave a margin of at least 10 characters on each side of the text.
3) On the first page you should put the following:
   Name of the article
   Machine that it is for (C64/128)
   Any extras required - disk, printer, add-ons etc.
   Your name
   Your address
   Your telephone number
4) The top of every page should have the following information on it:
   Abbreviation of the article title
   Your name
   The page number
   For example, suppose you had submitted a piece on C64 3D graphics. You should put something like this at the head of the page:
   3D/G. Brown/1
5) Please make sure that you do not make any additional marks on your text, especially underlining.
6) Try to write in clear concise English. Your contribution does not have to be a great work of literature, but it must be comprehensible.
7) On the bottom of each page you should put the word MORE if there are more pages to the article, or ENDS if it is the last page.
8) If possible, enclose a listing of all programs.
9) Use a paperclip to hold the pages together. Do not staple them.
10) When submitting programs for the disk, submitting the program alone is not enough. Please tell us how to load, run and use it, preferably in as much detail as possible. If there are any interesting programming point involved, explain them to us.
11) Please do not submit machine-code programs as Basic loaders of the sort certain other magazines would accept. If you have any points, however, to make about the working of the program, an assembler source file on the disk would be handy, preferably for Your Commodore's Speedy Assembler.
12) Programs for the disk should be in as few chunks as possible. This makes our disk menu easier to set up.
13) Programs under 10 lines can be included in the text. If your program is longer than this it must be on a disk.
14) If your article needs any artwork, then supply clear examples of what you want. We don't expect you to be an artist, but we do need to see what is required.
15) Photos, if necessary, must be either black and white prints or colour slides. We can take shots ourselves, so don't worry about this too much.
16) Submissions of any length are welcome. A five-line routine may be just as welcome as a six-part series of 2000-word articles.
17) Payment varies quite a lot and depends on quite a number of factors, such as complexity and presentation of program. For articles, the number of magazine pages taken up is the salient factor.
18) All payments are made in the month that the magazine containing your article has appeared in print.
19) If we do find your submission suitable for inclusion in the magazine, we will write to you giving the terms of publication, the rate of payment, and an agreement form. Prompt return of this form will allow us to use your program as soon as possible.
20) If you want the program to be returned to you, should we find it suitable for publication, then you should enclose a stamped addressed envelope.
21) If you use a wordprocessor, then enclose a copy of your text on the disk and state clearly which wordprocessor you use.
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